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Notable Advance Made in Foundry Practice in the Last Ten Years

By HERBERT R. SIMONDS

"HAD the present standard of quality and uniformity of castings been achieved ten years ago, much of the business which was deflected to other methods of fabrication would have been retained in the foundry industry." That is a recent statement of one of the country's most prominent foundrymen. The accompanying article describes some of the more important changes which have taken place in foundry practice during the past ten eventful years. Physical properties almost undreamed of in 1922 are standard practice today. New alloys, better methods of testing, and more exacting demands in raw materials and equipment are some of the factors contributing to this progress.

THE assurance of sound castings which the purchaser has today is the result of the gradual development of better foundry practice rather than of any outstanding changes or sudden improvements. To the active foundryman the progress has been undramatic and in some cases unnoticed, and yet, when he looks back at his own records covering his 1922 practice, he may find to his surprise that the ultimate strength of his castings at that time was about equal to the yield point of his castings today and that his rejections in 1922 were perhaps twice his present rejection average.

The biggest factor contributing to the general improvement in quality of castings has been month-to-month attention to the multitude of small details which constitute the full science of the manufacture of castings. The foundry, in a word, has become a better production unit.

Sand problems have been solved and the quality of all raw materials has been improved as a result of an insistent demand from foundrymen. As a case in point, one large foundry discovered that the sheen on a certain brand of pig iron carried over to produce a pleasing surface condition on its castings. Repeated tests failed to produce this condition with poor-appearance iron. Here apparently was a new quality independent of chemical characteristics. The experience of this foundry caused other producers to consider appearance in their selection of pig iron.

Improved foundry technique includes a better use of jigs and templates, improved design of patterns, which makes for the use of standard cores in jobbing foundries, and the development of new and more thorough testing methods.

A gradual progress in the field of metallurgy is, of course, one of the outstanding developments in the foundry industry, and the improvement in machining operations is another closely associated advance which has contributed to the more efficient production and use of castings. The use of tungsten carbide and other hard cutting tools has lowered the machining allowance due to the fact that these tools readily cut scale and so do not have to use as great a depth of cut as otherwise required.

Under the general head of supervision there have appeared many new methods of testing. The X-ray analysis, while still seldom used to detect defects of individual castings, nevertheless has experienced a marked development as a measure for controlling practice, and the relative freedom of concealed defects in castings today is due in no small measure to this method. In the case of high-

pressure service there has been an increase in the actual 100 per cent X-ray testing of castings.

Recently the gamma ray test has come into prominence as a less expensive method of detecting flaws in heavy sections. Gamma ray capsules are now available for commercial use at comparatively low cost. A foundryman has merely to place a capsule on one side of a casting and a sensitized plate on the other when he goes home at night and in the morning he finds a negative which indicates the casting's internal structure. Other methods of non-destructive testing which have developed in recent years include electric resistance, magnetic dusting and sound wave transmission.

The welder's torch has been responsible for extensive changes in foundry procedure. The cost of cleaning and reclaiming operations has been greatly reduced by improved practice in the use of both the electric arc and the gas welding torch. In fact, it is difficult to exaggerate the influence of welding on the foundry industry. At first the welding art was regarded as a threat by many foundrymen, but now it is pretty generally admitted that the advantages of welding more than offset any disadvantage due to the substitution of rolled steel welded parts for castings.

A new method of cutting off risers has been employed recently. This involves the use of a high-speed friction saw. In the case of certain mass production units the casting itself has been revolved in contact with the saw and by this means risers 5 in. in diameter have been cut off at the rate of one a minute, including the set up time.

TABLE I

Production of Steel Castings in United States in Percentages of Total Output by Processes

Year	Open-Hearth	Electric	Converter and Crucible
1922	80.30	14.98	4.71
1923	79.05	16.18	4.76
1924	76.68	18.43	4.89
1925	73.24	22.31	4.37
1926	72.63	24.05	3.32
1927	71.16	25.45	3.40
1928	68.96	28.60	2.33
1929	71.53	26.47	1.96

TABLE II

Standard Specifications Covering Cast Steel Locomotive Frames

	1923	1928	1931
Tensile strength, lb. per sq. in.	80,000	85,000	90,000
Yield point, lb. per sq. in.	50,000	55,000	60,000
Elongation, in 2 in., per cent	20.0	25.0	25.0
Reduction of area, per cent	40.0	50.0	50.0

Steel and Alloy Castings Improve

CURIOUSLY enough while in nonferrous foundry practice there has been a decided trend toward a decrease in the number of alloys, the steel foundryman has turned to more and more alloys to meet the demands

for a great variety of physical properties. Perhaps the most notable development during the past ten years in this direction has been in the field of corrosion and acid-resisting castings. Well standardized alloys of chromium or nickel-chromium steel have found vast new outlets in building construction and in the chemical industry. Similar introduction into many other fields is starting. Among these may be mentioned the automobile, paper, food and textile industries.

Some idea of the progress in use of alloy steel castings may be gained from the fact that in 1922 the total output under this classification was 66,000 tons, whereas in 1929 it had increased to 216,000 tons. Of this large total, according to a report of the Electric Steel Founders' Research Group, 48 per cent was produced by the open-hearth method, 48.8 per cent by the electric furnace and the small remainder by converter and crucible. The electric furnace today assumes major importance in the production of alloy steel and its influence in the production of standard steel castings is gradually increasing. In 1922 the production of steel castings in open-hearth furnaces totaled approximately 1,000,000 tons as against 200,000 tons for the electric furnace. During the succeeding years up to 1929 the open-hearth production showed no appreciable upward trend whereas the electric furnace production of steel castings increased rapidly up to approximately 460,000 tons in 1929. Table I illustrates the upward trend of electric steel castings.

TABLE III

Typical Properties of Malleable Iron

	1922	1932
Silicon	0.80 to 0.90%	0.80 to 0.90%
Carbon	2.40 to 2.80%	2.20 to 2.40%
Manganese	0.25 to 0.30%	0.30 to 0.40%
Sulphur	0.07% or under	0.05% or under
Phosphorus	0.20%	0.20%
Annealed at	1600 to 1650 deg.	1650 to 1700 deg.

Tradition Often a Handicap

As foundry metallurgy improves and the various alloys increase in such qualities as machineability, ductility and yield point we may expect wider and wider application in industry. Aside from quality, however, the influence of custom or tradition is to be considered. One foundryman asked: "Why cannot we design connecting rods, straps, crankshafts and cranks in cast steel? Without a thought of insecurity we subject 8 sq. in. of cast steel crosshead to 47,000 lb. alternately 18 times a minute, but we must have 10 sq. in. of forged connecting rod coupled to that crosshead subjected to the same loads and vibrations."

One of the most interesting features in the progress made in the foundry industry is the fact that certain desired properties have been set up and alloy castings or specially processed steel castings then have been produced to closely meet the specifications. An example of this is the case of an alloy developed by the General Electric Co.'s steel foundry at Everett, Mass. There was a need for a casting with exceptionally low creep at high temperature. After much research a molybdenum alloy steel was produced to meet requirements. This has approximately the following composition: carbon 0.32 to 0.35, manganese 1.35, silicon 0.35 to 0.40, molybdenum 0.30, phosphorus and sulphur, below 0.04 per cent. In connection with this development the foundry superintendent states: "Tests indicate that this alloy has less creep than any other alloy we know about but our study is still going on and it may be we will find something even better."

Another superintendent of this same company states: "We have increased the carbon content of our carbon steel castings by about 0.10 per cent and we anneal all of them. This has raised the elastic limit and ultimate strength with no decrease in elongation or reduction of area."

Conforming to advances in other fields steel castings have enjoyed a remarkable increase in uniformity and in tensile strength and a striking reduction in the number of concealed

TABLE IV

Alloy	Yield Point in Lb. 1922	Yield Point in Lb. 1932	Tensile Strength in Lb. 1922	Tensile Strength in Lb. 1932	Per Cent of Elongation in 2 In. 1922	Per Cent of Elongation in 2 In. 1932
Gear bronze	26,000	38,000	42,000	55,000	18	20
High lead bronze	16,000	20,000	20,000	27,000	4	6½
Manganese bronze	28,000	34,000	65,000	85,000	20	25
Rolling mill housing nut	30,000	35,000	42,000	50,000	10	15

THE present economic condition has driven prices down to a competitive level that does not encourage the manufacturer to make quality the first objective. The effect of this is serious in the foundry industry, and the comment in this article on the gradual increase in quality of castings should be somewhat tempered to more accurately describe general practice at the moment.

A consistent and surprising betterment in physical properties and in foundry practice continued throughout the industry up to the first part of 1930. Since that time some foundries have felt forced by price competition to produce castings of a quality somewhat inferior to that produced by them in the past.

defects. The increase in tensile strength is illustrated by the published specifications of most any steel foundry covering the years from 1922 to 1932. The Union Steel Casting Co., Pittsburgh, for instance, published in 1923, specifications covering cast steel locomotive frames which showed a tensile strength of 80,000 lb. per sq. in., whereas the published specifications for this same type of locomotive frame in 1931 showed a tensile strength of 90,000 lb. per sq. in. The comparative figures for other physical properties for this same piece are shown in table II.

Better Attention to Details

Demands for better design and workmanship have kept pace with the demands for improved physical properties. In certain steam turbine work it was necessary to have the inner cored surface entirely free from embedded sand. After a great deal of study this problem was finally solved by close attention to many details. A better sand was needed and it was found important to use a high silica washed sand with uniform grains. A better face wash was developed by using a mixture of bentonite and oil to help keep the ground silica quartz in suspension. Other details included design of gates and accurate temperature control at time of pouring. This case of attention to detail is typical of the work of many progressive steel foundries and because of this some of the products formerly made with forgings are now products of the steel foundry.

The former casualness on the part of steel foundrymen in regard to internal defects has been blamed for the loss of much business of an important character. Now with better practice and better methods of testing, a freedom from defects in general production should help some of the conscientious foundrymen to regain this lost business.

Malleable Iron Has High Yield Point

IN 1922 the average standard specifications for malleable iron castings called for an ultimate tensile strength of about 38,000 lb. per sq. in. with an elongation in 2 in. of about 5 per cent. No mention of yield point characteristics was made at that time. Through efforts on the part of the Malleable Iron Research Institute, in cooperation with A. S. T. M. Committee A-7, the minimum requirements gradually were increased, first by raising the ultimate strength and elongation only, and subsequently by including a yield point requirement of 30,000 lb. per sq. in. Last year the requirements were further increased and two specifications were adopted with the following classifications and properties: For grade No. 32510, tensile strength 50,000 lb., yield point 32,500 lb., elongation 10 per cent; for grade No. 35018, tensile strength 53,000 lb., yield point 35,000 lb., elongation 18 per cent. While these specifications are now standard and are in use by most of the manufacturers, there are certain plants which are furnishing material on a still higher specification.

It is interesting to note that the high yield point at present is about the same as the ultimate strength called for in specifications of ten years ago. In the metallurgy of malleable iron important changes also have taken place. The tendency has been to reduce the carbon content and to increase the annealing temperature. The Timken Roller Bearing Co., Canton, Ohio, gives a typical comparison of its malleable iron in 1922 and at present, and this is shown in Table III. The company now produces a product with a tensile strength of 50,000 lb. and an elongation of 15 per cent.

By closer attention to temperature control, to non-oxidizing design of furnace and to the effect of different elements, it has been possible greatly to reduce the annealing time required for malleable iron castings and to increase varying properties such as tensile strength and malleability. One company, for instance, now supplies soft malleable castings with a tensile strength of 42,000 lb. and with very high elongation, and, by changing conditions, this same company produces malleable castings with a tensile strength of 60,000 lb. or more and an elongation of 14 per cent or less. This company reports that by a new type of thermocouple control the annealing temperature has been held within remarkably small limits and by this means alone it has been possible to shorten the time cycle and to secure greater uniformity in quality. Considerable research work has been done in the field of nitriding of malleable castings, and, while this is not yet developed to a point of commercial application, some investigators have found it possible to secure in the laboratory a malleable iron with a nitrided case which is hard enough to cut glass.

Non-Ferrous Castings Are Standardized

THE development of the technique of heat-treating aluminum has greatly increased the scope of application of aluminum castings, and this is one of the outstanding developments in non-ferrous foundry work. Aluminum castings are being used extensively in aircraft work, where tensile strengths as high as 35,000 lb. per sq. in. are being readily secured after heat treating. A 10-ton crane recently was built entirely of aluminum and many of the parts were castings. Aluminum castings are being used for end shields for motors. Cast aluminum stair treads with embedded abrasive material in the surface have been used to help reduce weight in ship construction.

Aluminum castings cost about three and one-half times as much as iron castings, but for equal strength the weight of the aluminum is frequently less than one-half the weight of iron. In yellow metal castings there has been a marked tendency to standardize and to reduce the number of alloys. One large company turning attention to this particular feature has been able to cut down its regular brass and copper alloys from more than 40 in use some years ago to five at the present time and now claims that these five selected alloys cover all of the commercial demands.

In brass and bronze foundry work an important development has been the progress which smelters have made in producing cleaner ingots. This has come about through competition and a better educated demand on the part of the foundry. It is seldom that an ingot containing dross can get by a foundry inspector today whereas ten years ago the presence

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THE FOUNDRY INDUSTRY NOW AND A

By EDWIN F. CONE

IN view of the fact that the foundry industry in all its branches—gray iron, steel, malleable iron and nonferrous—has been seriously affected by the depression, even more deeply than the main or finished steel branch of the American iron and steel industry, interest centers in the extent of this effect on the activity of the foundry industry as a whole and of each of its various sections. Business has fallen off so sharply that the steel foundry industry is operating now at not much more than 15 per cent of capacity, with other branches little if any better off.

To obtain authoritative information regarding the effect of present conditions on the foundry industry, the views of some representative men were solicited for the following symposium. Opinions were asked as to the effect of the depression on the business represented by each contributor, as well as to the probable trend when more normal conditions return. The point was also emphasized that pressure on costs is one of the dominant characteristics of the current period, and information was requested regarding what is being done to cut costs, either through improvement of methods or modernization of equipment and plant.

It is felt that the views reproduced in the following paragraphs offer some valuable suggestions as to effects and trends. They indicate that the foundry industry as a whole has been putting its house in order so that, when prosperity returns, better products at lower costs are probable.

Some of the testimony is to the effect that the next decade will see a measure of progress far exceeding anything experienced in the past, and that the industry will have learned something from adversity to the extent that it will be on a more substantial plane than was the case following other depressions. One authority believes that better conditions are already discernible and that a rising market will come soon.

Not a little emphasis is placed on alloy castings of all kinds, particularly gray iron and steel. One of the marked advances in the foundry industry before the depression was the greater production of alloy steel and alloy gray iron castings. A broader use of alloy steel castings is in the offing. With the use of the electric furnace and heat treatment, a new gray iron is now available, made possible by addition of alloys and by changes in the process of production. In fact, only a beginning has been made in the heat treatment of gray iron. In these two foundry fields, prospects are bright, and in the development of new alloys of all types, particularly non-ferrous, the future has much in store.

As an introduction to the symposium, a contribution by T. S. Hammond, the newly elected president of the American Foundrymen's Association, has been selected.

The Foundry Industry as a Whole

By T. S. HAMMOND

President, Whiting Corpn., Harvey, Ill.

SO far as the foundry industry is concerned, about the brightest spot in the general situation is the fact that users of castings have begun to see that some of the substitutes adopted in recent years are perhaps not so desirable after all, and that for many purposes the casting is supreme.

Water will seek its own level. Artificial stimulus, based on novelty and intensive propaganda, may change industrial habits for a while, but, in time, results will tell. It is significant that the automotive industry, with its unequalled facilities for research and marked progressiveness, has declared in favor of castings for various parts. For example, it is reported that the new Ford car has 40 lb. more malleable castings than the previous Model A, besides increased amounts of other castings.

All this goes to show that the casting has not outlived its usefulness and that the foundry industry is far from being ready for the discard. On the other hand, it stresses the importance of being wide awake and prepared to compete with the developments of the future.

The marked progress made in foundry methods in recent years, resulting in castings of higher standards, and the increased activity along research and experimental lines are evidence

T. S. HAMMOND

N. K. B. PATCH

J. W. BOLTON

ND AFTER THE DEPRESSION—A Symposium

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of the fact that the last chapter in the story of castings is a long way off. I firmly believe that the next decade will see a measure of progress far exceeding anything we have seen in the past.

Non-Ferrous Castings

By N. K. B. PATCH
Secretary, Lumen Bearing Co., Buffalo

THE general economic conditions, which have decreased the demand for all manufactured products, are affecting the non-ferrous casting industry, just as they are affecting all other types of industry. The low costs of the constituent metals, copper, tin, lead and zinc, in these non-ferrous castings have influenced buyers to buy only those castings immediately needed, with the thought that the market may decline further any minute and therefore it is probable that lower prices may prevail at any moment. With that attitude no one is buying any castings in anticipation of future needs and are confining their purchases to such limited quantities as are urgently needed.

The effect of this attitude is to demand of the foundry the production of a minimum number of pieces from a given pattern, resulting in the production by the foundries of small unit orders and in no case are the orders large enough to permit the foundries to produce on a mass production basis, which would result in the minimum cost for the castings produced.

In spite of this condition many foundries are quoting prices that are so low as to preclude any possibility of a profit. It is no uncommon experience for foundries to find that their castings have been sold below cost and therefore they have actually made a cash contribution to the purchaser of the casting. A continuation of this policy will ultimately mean the ruination of many foundries.

In many foundries the number of orders may be encouraging but the quantity of castings per order is such that they cannot be produced at a normal cost, and yet they persist in quoting low prices in the hope that the volume will increase in the near future and also in the conviction that, unless they do quote extremely low prices, they will lose customers.

There are a few foundries that are courageous enough to quote prices that are based on actual cost figures. It is a well known fact that a large number of the foundries have little or no knowledge of the actual cost of the manufacture of their product, except in a very general sense. In consequence, they quote prices that are based on inaccurate knowledge and all too frequently on rumors of the quotations of their competitors that are frequently untrue.

These conditions are probably equally true for other foundries than the non-ferrous ones. The non-ferrous foundries are so often only small plants with incomplete organizations and without proper personnel for determining the real reason for their losses that the condition of unintelligent quotation is probably more noticeable than in other branches of the foundry industry.

If there is any one thing that the non-ferrous foundrymen should learn from present economic conditions, it is the importance of knowing their costs and basing their quotations upon these figures and demanding prices for their product sufficient to show them at least a small profit, so as to insure themselves against depletion of capital.

It is surprising how many buyers of bronze and brass castings there are who are now buying on a price basis only, without any recognition of the economy to be derived by paying a little more for a better quality and a longer lasting product. Short-sighted buyers, who are now insisting upon lowest first cost, are only going to have to repeat their purchases the sooner by reason of their mistaken policy and thus the economy that they see in their present purchases will be lost many times over.

Non-ferrous foundrymen will do well to learn from their present experience that a casting that gives maximum service is worth an honest price. The buyer of these castings will find it to his advantage in the long run to insist upon castings that are of the highest quality, even though the first cost is higher than when buying an inferior grade.

An interesting fact in connection with the use of non-ferrous castings today is the willingness on the part of

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consumers to try out some new-fangled alloy, which is touted to be something very new and something very wonderful but which, when examined in the light of modern knowledge of metallurgy and engineering, is nothing more than a new brand name for something that has been tried and found wanting in the past. Frequently, these new brands are claimed to be cure-alls for all bearing ills.

High Test and Alloy Iron

By J. W. BOLTON
Chief Metallurgist, Lunkenheimer Co., Cincinnati

THE present depression has forced most manufacturers and consumers to appreciate the true definition of the term "best materials." In more prosperous times careful analyses of ultimate costs were infrequent. That "best materials" are those which adequately meet service conditions at lowest overall or ultimate cost is more clearly understood by more people today, and careful analyses of ultimate costs are more frequent.

A very few years ago knowledge of practical production of higher strength irons was possessed by few. Today higher strength irons can be produced in the majority of foundries, and the literature on alloy cast irons, heat-treated cast irons, super-strength cast irons, etc., is quite voluminous.

From the viewpoint of the foundryman some higher strength irons can be produced rather inexpensively. However, in castings of non-uniform section, the use of comparatively costly alloys frequently is imperative. In other cases alloys are needed to produce certain combinations of physical characteristics. If heat treatment is necessary, another expense is encountered. The successful production of high-strength irons demands close metallurgical control. In many cases foundrymen have had to use special melting equipment. Therefore, in some cases, it is found that higher strength irons can be produced at relatively little increase in cost per pound. In most cases the cost of castings is materially increased.

Variations in Machineability

It has been well known for many years that irons of equivalent strength may vary in machineability. Careful study sometimes enables one to get better physical properties in the iron with little or no decrease in machineability. By and large, however, the higher the strength the lower the machineability. One cannot expect to jump from 30,000 lb. tensile to over 55,000 lb. tensile and retain the same degree of machineability. Because of the high direct expense and greater overhead in the machine shop (compared with the foundry) decrease in machineability may be a more serious matter than increase in cost of castings production.

Application of higher strength irons may be justified by the following and other factors:

(1) More than commensurate increase in serviceability of the castings.

(2) Possibility of changes in design which allow the new material to be used with no increase in overall cost of production.

(3) Substitution of high-strength iron for other more expensive materials of construction.

Compared with lower strength irons, high-strength gray irons offer increased tensility, somewhat higher rigidity, some improvement in resistance to shock, greater hardness, greater wear resistance and better behavior in heat treating. They usually cost more to produce, some types are more susceptible to shrinkage defects, and the machineability is lowered. All factors should be carefully analyzed in each case to make sure that higher strength irons are the "best material" before such irons are adopted. It must never be forgotten that the "garden varieties" of gray iron will continue to be the best materials in many cases.

The high-alloy austenitic cast irons (such as Ni-Resist and Causul Metal) possess rather unique properties, and field experience demonstrates their ultimate economy in many corrosive services. In a number of cases they not only have proved superior to cast iron, but also have supplanted more expensive materials of construction.

Cast Iron Pressure Pipe

By W. D. MOORE
President, American Cast Iron Pipe Co., Birmingham

DURING the ten years prior to 1930 the production end of the cast iron pipe industry had been revolutionized so that we entered the period of depression with modernized and highly efficient producing units, and about the only thing the depression has meant from a manufacturing standpoint is to squeeze out the last drop in the way of economies, both in labor and materials. While there have been some reductions in the cost of manufacture, they were not of a major nature, since this had already been accomplished through the development of new processes of manufacture during the preceding ten years.

The outstanding result of the change in processes has been that of producing materials of very much higher quality than was formerly the case, with the result that the weight of the pipe has been reduced approximately 10 per cent and the working pressures have been increased for a given thickness approximately 100 per cent.

By way of illustration: The old standard Class B pipe rated for 86 lb. working pressure being taken as a standard for a basis of comparison, we find in the modern process pipe a reduction in weight of approximately 10 per cent and an increase in the working pressure from 86 to 150 lb., at the same time maintaining equal or better factors of safety.

In addition to the above we are now able to produce super-strength cast iron products, as well as all forms of alloyed products, and have thus established our right to enter fields previously closed to the cast iron pipe industry. By way of illustration: We compete for high-pressure oil and gas transmission lines, formerly considered completely outside of the scope of a cast iron pipe, and we do not hesitate to supply material for this class of service with the pressures ranging from 500 to 1000 lb.

Likewise in the oil refineries and chemical industries we are now able to supply materials of super-corrosion and acid-resisting qualities which are more than economical when considered in the light of any other available material.

Since 75 per cent of our market is financed through the sale of bonds or stocks, most naturally we anticipate an improvement in volume with an improvement in the bond market, and with an improvement in the bond market there will come an improvement in the stock market and this will improve the financial situation of the public service corporations. This should bring about a definite betterment in the volume of business.

The desirability and necessity for providing public work in lieu of a dole should result in bringing out definite business for the cast iron pressure pipe industry.

The ever-increasing demand for sanitary conditions dictates an increase in the number of water filtration and sewage disposal plants throughout the country. This is a fundamental branch of the cast iron pipe business, and naturally with an

improvement in the bond market we shall see an increase in business coming from this field.

The cast iron pipe business always has shown a relatively rapid recovery after a period of depression and we have no reason to believe that history will not repeat itself this time.

Developments in Gray Iron

By H. BORNSTEIN
Chief Metallurgist, Deere & Co., Moline, Ill.

RAPID progress has been made in the field of gray cast iron during the past five years. And we may expect much during the next few years.

For many years to most engineers cast iron was just "cast iron," a material low in physical properties and uncertain as to results. There has now come a realization that cast iron is the name of a whole group of materials and a definite cast iron may be produced to serve a particular purpose. A specification is now being developed by the American Society for Testing Materials which will divide cast iron into classes according to tensile strengths. Higher strength irons, having tensile strengths of from 40,000 to 60,000 lb. per sq. in. are now being regularly produced. The engineer will be able to specify the materials he requires and be reasonably certain of obtaining them.

The cupola is still the dominant melting unit for gray cast iron. For most grades of iron it gives excellent results with low costs. By proper care and supervision, the quality factor can be maintained and the costs can be reduced. The watchful foundryman acquaints himself with the markets on his raw materials and varies his mixtures to secure a maximum in results from a minimum of cost.

The rotary furnace (of the Brackelsberg type) fired with pulverized coal has found considerable favor abroad and is just coming into the picture in the United States. It offers advantages in respect to control of product and the fuel costs should be low. There are good possibilities in the use of this furnace in the duplex process: (1) melting in the cupola and (2) refining in the rotary furnace.

The electric furnace is making rapid progress in the gray iron field. Both the cold melt and duplexing are used, costs usually being lower on the latter method when there is sufficient production. The electric furnace and the air furnace are usually employed for producing the higher qualities of cast iron.

We have just scratched the surface in the field of heat treatment of cast iron. Just as in steel, we first must have a material which will properly lend itself to heat treatment. Excellent results are being obtained by quenching and drawing cast iron and we may expect rapid progress in this field.

The engineer is learning that he can obtain a reliable material in cast iron and one which will give him definite physical properties. It should be emphasized that, for many purposes, cast iron is the best material. With this information in the hands of the designer, cast iron should assume its proper place as an engineering material.

Alloy Steel Castings

By A. W. LORENZ
Metallurgist, Bucyrus-Erie Co., South Milwaukee, Wis.

PRESENT economic conditions will of necessity result in a broadened use of alloy steel castings. Improvements in machine design, brought about by intensive competition, will create a wider demand for alloy steels. Foundries will be called upon to furnish not merely a few standard alloy analyses, but also types of a more or less special nature to suit specific applications.

Many foundries already find in this field the possibility of building a desirable volume of business, and there is an increasing tendency for the jobbing foundry to diversify its lines by offering almost any desired analysis of alloy steel. Castings of the nitriding type are being produced in considerable quantities, and the manufacture of heat and corrosion-resistant castings is being undertaken by a number of foundries who formerly limited their activities to plain carbon and low-alloy types.

To the engineer, these items should provide an opportunity for introspection into the properties of the various grades of steel which he has favored in the past. Considerable dead wood can be eliminated where present analyses possess similar characteristics.

For ordinary constructional purposes, the strength of alloy steel casting types seems to have reached a practical working limit at about 150,000 to 175,000 lb. per sq. in. where reasonable ductility is required; or slightly in excess of 200,000 lb. per sq. in. where ductility is not a factor. It is possible to obtain these strengths by heat treatment with a number of alloy combinations.

With no probability of greatly improving on these figures in the near future, the trend in ordinary engineering steels is rather toward the development of cheaper alloy combinations which will render equivalent service at lower cost. The cheapness of manganese as an alloying material has prompted the development of many

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modifications of intermediate manganese steel containing one or more additive elements. Manganese-molybdenum, manganese-vanadium, and chrome-manganese-silicon may be mentioned among those types which have appeared recently, offering physical properties practically equivalent to some of the older and more expensive steels. The reasonable cost of some of these newer alloy types should offer to designers and engineers the possibility of effecting considerable economies in the manufacture of those products which demand or permit the use of steel castings.

Effect of the Depression on the Electric Steel Casting Industry

By R. A. BULL
Director, Electric Steel Founders' Research Group, Chicago

THE depression has by no means stopped investigational work in the small casting branch of the steel foundry industry, but research in this field has been broadly extended to cover, in proportionately greater degree than heretofore, the cost of production.

The big job at present puts more emphasis on economics. The cost in the long run, as affected by shock, fatigue, surface wear, corrosion, heat attack, etc., is being studied intensively by those who are continuing technical development, and who are striving to keep labor, material, and overhead expense as low as can be done consistently to influence first costs favorably.

It would be trite to elaborate on the discouraging effect on financial recovery of the efforts of some consumers to obtain something for nothing. But it is gratifying to observe that there is now a growing tendency in industry generally to discourage the demoralizing demands for still lower commodity prices.

Discerning buyers and consumers realize there is a point in the scale of selling price reduction where serviceability is apt to be affected injuriously.

In their strenuous effort to break even during this stage of very low tonnage outputs, far-sighted steel foundrymen have effected cost reductions without sacrificing quality which in some cases have been remarkable, exceeding anticipations. Efforts have been exerted in these directions about as far as they can be expected to go, until business conditions so improve as to permit some companies to make investments in labor-saving machinery that would further reduce costs at a given volume of business.

Fortunately, numerous concerns have been able to install such equipment during the dull period. And the facilities at present available, coupled with the information now acquired and being obtained in respect to special steels, heat treatment, etc., place the electric branch of the steel casting industry in a highly promising position for service. Considering the experience heretofore gained and yet being acquired, there is a lot of comfort steel foundrymen may get in realizing that the good future of their industry is assured.

Development and Use of Foundry Cost Systems

By A. E. GROVER
Cost Director, Gray Iron Institute, Inc., Cleveland

WHAT part will the development and use of foundry cost systems play in the adjustment of policies as we approach normal business?

Actual costs of castings that have prevailed during the past three years, 1929, 1930 and 1931, have been too erratic to be of value to the foundryman in establishing a profitable selling policy in the new, highly competitive order of things. A majority of the foundries were running overtime in 1929. The depression of 1930 and 1931 brought the production of castings for each individual foundry gradually to the very low level that is experienced in the industry today. And this decline in volume of business has not been uniform among the various individual companies of the industry.

As this industry recovers along with other allied industries from this severe case of "depressionitis," it will be necessary for the individual companies to give their business policies and procedures more careful analysis than they have ever done before, if they expect to be a party to placing the industry upon the business plane that it deserves.

There has been a recent tendency for purchasers of gray iron castings to be a little more logical in their reasoning concerning the license of the foundryman to make a fair profit on his invested capital. The better-thinking purchasers like to do business with foundries and other suppliers that know their costs and use them as a basis to establish a selling price that will return them a fair profit for efficient service. It is to be hoped that there will be more of this type of purchasing executives when the depression has been lifted and business gets back to normal operations.

Changes in the price level of all basic elements going into the cost of castings must be anticipated. These elements consist mainly of:

a—Metals
b—Supplies
c—Producing labor
d—Indirect labor
e—Supervision

It will not be safe to use past purchase records on any of these elements in establishing costs of individual castings. Neither can inventory values be established safely if they are calculated on past purchase records. All of these elements must be calculated upon the market price prevailing when the product is expected to be made and under *normal* purchasing conditions.

There is at present in the foundry industry a tremendous variation in depreciation rates and values of permanent assets used as a basis for establishing fixed charges for inclusion in costs of individual jobs. Under the new order of business it will be important that the present-day utility value of these assets be carefully established so that the foundrymen will include depreciation, taxes, insurance, and possibly interest on investment, in the estimated cost of jobs on a uniform basis with their competitor. If they do not do this, they are liable to either turn profitable business to their competitor or accept orders that will not return profits.

Not so many years ago castings were almost entirely sold on a tonnage basis, but at the present time there is an increasing demand for quotations based upon a separate selling price for each individual casting produced; and this will be one of the important factors in good costing as business gets back to normal. The far-sighted foundryman will accept these conditions and make such necessary changes in his methods of costing before he is ready to use them, so that he will be ready to analyze the profit possibilities of each job submitted to him for quotation and take his pick

of the jobs, leaving the undesirable ones to the foundryman without dependable cost information.

The foundryman who will succeed under the new regime will have his system so designed that he will be able quickly to predetermine the cost of each separate job before he makes a quotation to his customer. He will sense the importance of uniform cost knowledge in the industry and will not be inclined to include any excesses or efficiencies of his own plant in the selling price, but will treat them as operating losses and profits and so indicate them on his profit and loss statements.

The Gray Iron Institute recognizes the condition of the industry today and what will be necessary for the individual companies, making up its membership, to do to prepare themselves to meet the marketing conditions with proper cost methods. The institute has established a uniform cost system that is basically sound. The officers of the institute are keenly interested in its adoption among the members, which indicates that the foundry industry will have learned something from the depression and be on a more substantial plane than has ever been experienced in the industry following depressions of the past.

Trend in Foundry Construction

By FRANK D. CHASE
President, Frank D. Chase, Inc., Chicago

PRODUCTION has decreased to a point where most foundry executives hesitate to spend money either because they have none to spend or because they are waiting for some assurance that this country is not "going to the bow wows." No sane man believes that it is in his own mind, but most executives are today acting as if it were, in their official capacity.

Production costs must be cut, and in most foundries they can be cut radically, not by installing equipment sold by a high-pressure salesman, thereby securing the cheapest or even the most expensive, but by cooperation with a competent consulting engineer to develop what is the best method and equipment.

Manufacturers in all lines are in need of new or rehabilitated equipment. Not content with a saving of 30 to 60 per cent from 1928-9 prices, they are waiting not only for the assurance of the permanency of this country, but waiting too for "the bottom"—hoping thereby to add one or two per cent to the 60 per cent saving.

Many, very many, clear-thinking executives believe that the turn has come, that inventories are at a minimum, and that when we do shake off the fear which alone is holding us all back, prices will stiffen and shoot up very rapidly. Some buyers will not only lose the anticipated one or two per cent extra savings, but a substantial part of the 60 per cent.

They will not be ready to buy. It seems difficult to convince anyone to buy at this time, and still it is being done. It should not be difficult to realize or convince another that everyone should be ready now to buy. Have programs, plans and specifications in the "P. A.'s basket," ready to take advantage of the last low quotation and beat the rising market, when it comes, as it will, I believe, very soon.

Steel Foundries Gird Themselves for Future

By GRANVILLE P. ROGERS
Managing Director,
Steel Founders' Society of America, Inc.

THE steel foundries have, in common with other branches of the steel industry, suffered as a result of the depression. Due to the tremendous falling off in business in practically all lines, average volume of production with relation to capacity dropped from 68 per cent in 1929 to 48 per cent in 1930 and 28 per cent for 1931 (estimated), while at present it is safe to say the entire industry is not operating in excess of 17 per cent of capacity.

This has resulted in a number of steel foundries closing down, some temporarily, others permanently. This in itself would be an encouraging factor because of existing excess capacity even in normal times, but as the average steel foundry can seldom be used for other types of manufacturing, it is to be assumed that many will refinance and open up when conditions improve.

Many of the foundries that are still operating are pouring heats only once or twice a week or as business is collected in sufficient volume. Practically every operating foundry has staggered working hours in order to give maximum employment.

In the face of present conditions, the complexion of the industry continues to change. With the advent of alloy steels, improved methods and processes, the progress of the business can no longer be measured by tonnage and volume but rather by the sales value of the castings produced.

With a large excess capacity existing, even under normal conditions, the competitive situation has been further demoralized by the tremendous drop in available business. Whatever stability existed in the price and profit structure of the industry in 1929, or previously, has been dissipated in a hungry scramble to secure business at any price, and in the meantime many users of steel castings have pursued a policy of deflationary buying to a point where profits do not exist. As a matter of fact some buyers are becoming concerned as to quality, finish and salability of the products of their sources of supply, and as no regulating powers exist to control the situation, it would seem that improvement in this direction cannot be looked for to any great extent until more business is available, when reason will dictate that continued waste of energy and resources will defeat profitable operations.

Practically every operating foundry has taken such steps as were within its province to reduce cost of operations and improve methods and efficiency. The Steel Founders' Society of America has made available to its members a method of comparing monthly operating costs that has established substantial savings. In addition, it has provided and made available to the entire industry a modern, uniform accounting and cost system, embracing a standard estimating procedure which, when utilized, provides not only an accurate knowledge of costs but points the way to greater efficiency, opportunity for savings, and lowering of costs of operation.

Some foundries that are closed have temporarily made provision for other plants to handle their customers' requirements, thus reducing cost of selling and overhead. Wage and salary reductions have been made throughout the entire industry. Practically all companies are maintaining reduced or skeleton organizations. In some instances, a shift has been made from day work to piece work. It should be recognized that in practically all cases reductions of whatever nature have, of necessity, been forced upon those responsible for the operation of the plants.

The effects of the depression and forced economy will, in my judgment, redound to the benefit of the industry as we gradually return to more normal conditions; especially does this apply to those companies who have

(*Concluded on page* 1116)

EFFECT OF SECTION ON TENSILE S

AN investigation of the sections of some large gray iron cylinders which failed in service led the authors to the conclusion that the strength of castings of different thicknesses follows a fairly definite law and that the effect of composition is greatly minimized as the section increases. Test bars do not afford a reliable basis for judgment. A probable strength range for all compositions in heavy sections is offered and a chart has been formulated for sections from 2 in. to 10½ in. thick.

CAST iron is a versatile material. By suitable control of composition and rate of cooling in the mold it is possible to produce in the ordinary size of castings anything from a soft, easily machineable gray iron to a hard, practically unmachineable white iron. Even in the same casting we may have both extremes, as in the case of chilled car wheels.

It is generally recognized that the section of the casting affects the properties, for a given composition. Heavy sections which cool slowly in the mold will be softer and weaker than lighter sections which cool more rapidly. It is not so generally recognized, however, to what a great extent the strength of a casting is affected by its size and section.

Most of the data available to the engineer and designer deal with the tensile strength as determined on specially cast test bars. These values may or may not be trustworthy. If the thickness of the casting corresponds roughly to that of the test bar, and the design is such that the soundness of the casting approximates that of the test bar, then only is the test bar strength anything more than a very approximate measure of the strength of the casting.

When the two do not correspond closely in size and soundness, wide discrepancies usually exist. Numerous attempts have been made to correlate the strength of castings with that of test bars poured from the same metal. A recently published correlation shows a difference of about 12.5 per cent between test bars cast 0.8 and 1.0 in. in diameter. This rapid decrease in strength indicates the importance of section size.

References in the Literature

There are relatively few references in the literature to the strength of cast iron in heavy sections. The most complete sources of information are articles by Rother, THE IRON AGE, Aug. 7, 1924, and Bolton, *Foundry*, Nov. 15, 1925, and THE IRON AGE, Dec. 9, 1926.

Rother determined the strength of various portions of specially prepared stepped castings, in which the section increased by ½-in. steps from 1 in. square at one end to 3 in. square at the other. He found that an iron, exhibiting a strength of 34,000 lb. per sq. in. when cast in the 1-in. square section, suffered a decrease in strength to about 18,000 lb. per sq. in. in the 3-in. square section, representing a loss of nearly 50 per cent as a result of the increase in section from 1 in. to 3 in.

Bolton published curves showing the strength of various cast iron mixtures in castings of various sizes, some as large as 9 in. in diameter. A marked decrease in strength was noted for all mixtures, which was progressive up to 4 in., at least, and then became less marked for further increases in size. The values given by Rother and Bolton are shown graphically together in Fig. 1.

Some Cylinders Which Failed

Some years ago the writers had opportunity to examine several large gray iron castings which had failed under conditions of service which were fairly accurately known. Decided differences of opinion existed as to the quality of the castings, their sound-

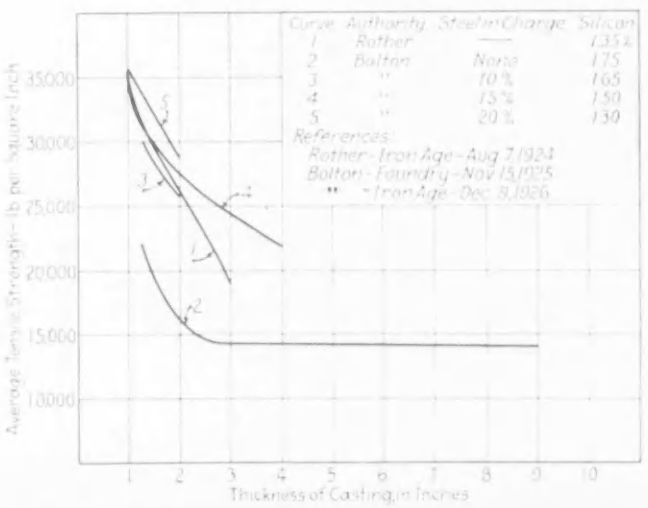


Fig. 1—Strength of cast iron in heavy sections according to Rother and Bolton.

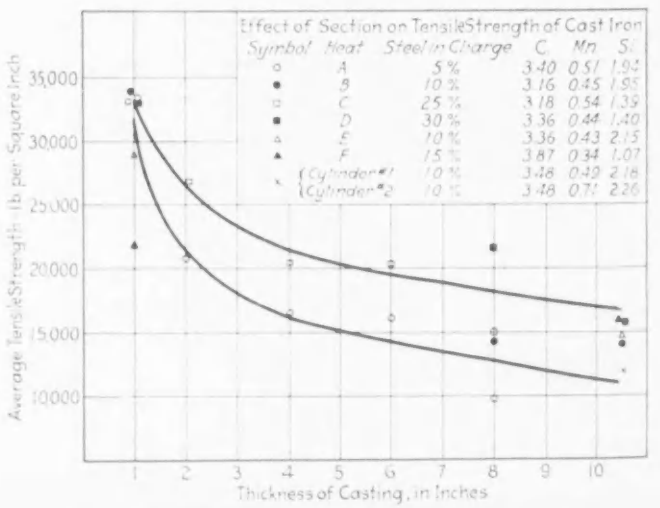

Effect of Section on Tensile Strength of Cast Iron
Symbol Heat Steel in Charge C Mn Si
A 5% 3.40 0.51 1.93
B 10% 3.16 0.45 1.95
C 25% 3.18 0.54 1.39
D 30% 3.36 0.44 1.40
E 10% 3.36 0.43 2.15
F 15% 3.87 0.34 1.07
Cylinder #1 10% 3.48 0.49 2.16
Cylinder #2 10% 3.48 0.71 2.26
Average Tensile Strength-lb per Square Inch
35,000
30,000
25,000
20,000
15,000
10,000
1 2 3 4 5 6 7 8 9 10
Thickness of Casting, in Inches

Fig. 2—Average tensile results of failed gray iron cylinders.

STRENGTH OF GRAY IRON

By F. P. GILLIGAN AND JAMES J. CURRAN
Secretary-treasurer and Metallurgist, respectively
Henry Souther Engineering Co., Hartford, Conn.

ness, strength and suitabilty for the service in which they had failed.

These castings were hydraulic cylinders, weighing about 30,000 lb. each when cast, with wall thicknesses of about 10½ in. The internal pressure to which they were subjected in service reached as high as 6000 lb. per sq. in. The compositions of the material of the two cylinders were:

Cylinder	Total Carbon	Manganese	Silicon	Phosphorus	Sulphur
No. 1	3.48	0.49	2.18	0.588	0.073
No. 2	3.48	0.71	2.26	0.682	0.055

While these analyses indicate a relatively high silicon iron for the purpose, careful examination of the fractures at the point of failure disclosed excellent soundness considering the great size and weight of the castings.

To determine the actual strength of these cylinders, exploratory tensile tests were made on specimens cut from various points, near the fractured surfaces. Most of the tests were taken at predetermined locations, namely, near the inside and outside surfaces, and half-way between them, at the top, middle and bottom of the castings. Other were taken at random and at points which appeared definitely unsound.

The tensile strengths observed in the 24 specimens taken from the two cylinders showed extreme uniformity. All except one fell between 10,000 and 13,850 lb. per sq. in., the one exception, taken from a visibly unsound section, showing a strength of 5000 lb. per sq. in. The average of all of the tests indicated a strength of approximately 11,650 lb. per sq. in. for the material of each cylinder.

Calculations by a modification of the Lamé formula for heavy cylinders indicated a maximum fiber stress in the walls of 13,000 lb. per sq. in. when the internal pressure was in the neighborhood of 6000 lb. per sq. in. Our physical tests indicated an average strength of approximately 11,650 lb. No factor of safety existed; hence it is not surprising that the cylinders failed in service. It is more a matter of surprise that they withstood anywhere near the maximum pressure applied, for the reason that invisible unsound areas might easily have lowered the average strength of the walls

(*Concluded on page* 1125)

Fig. 4—Structure of 10.5-in. wall of cylinder. 100 diameters.

Fig. 5—Structure of 1.0-in. sq. bar from Heat E of Table III. 100 diameters.

Fig. 6—Structure of 10.5 by 30 by 48-in. block from Heat E of Table III. 100 diameters.

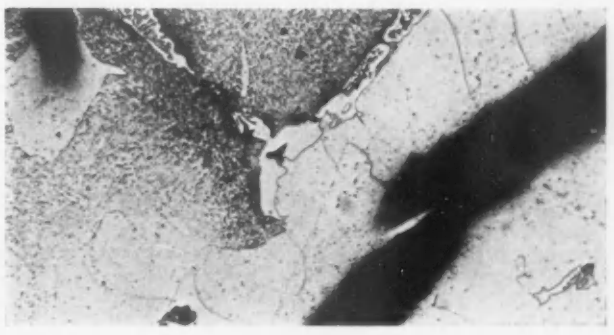


Fig. 4

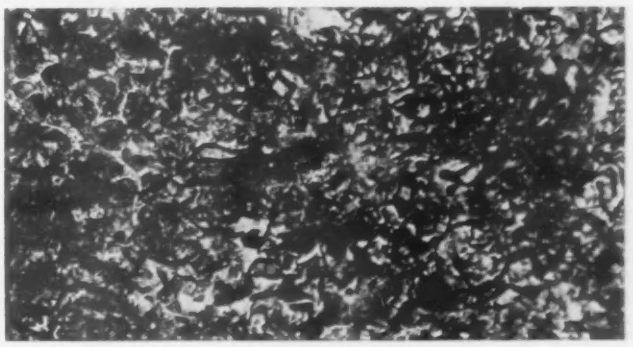


Fig. 5

Fig. 6

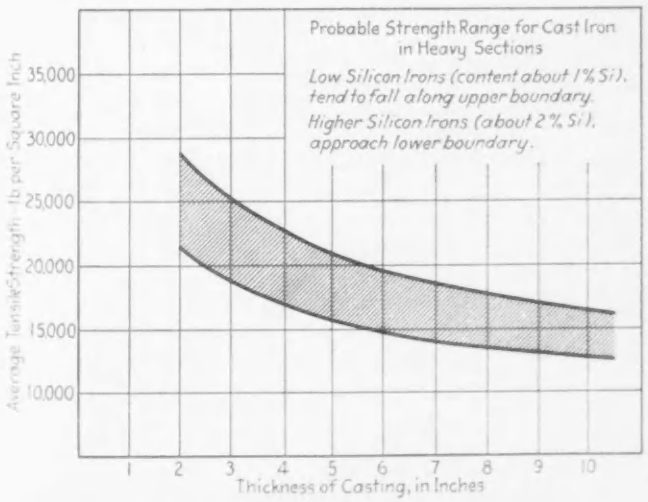
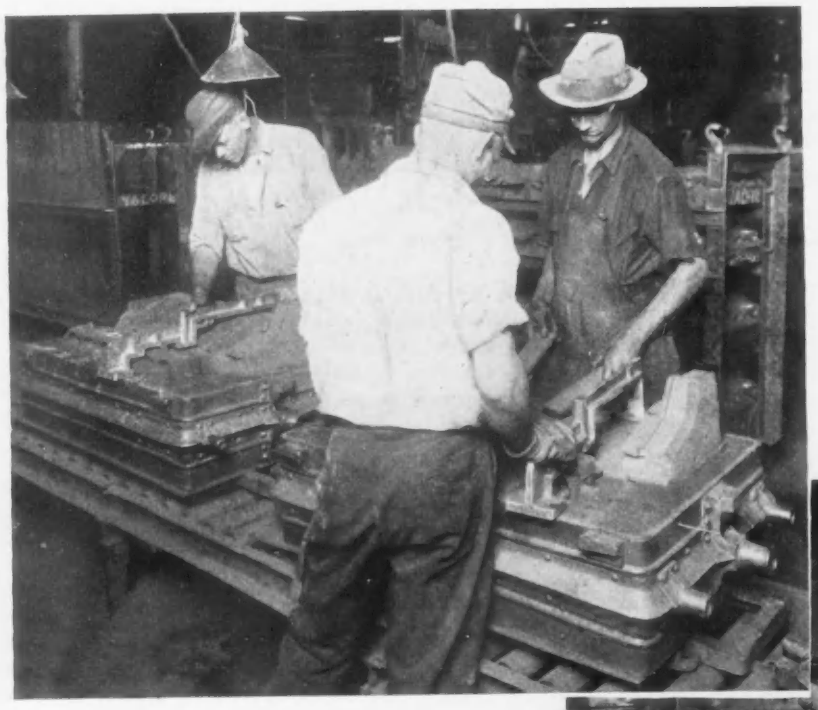

Probable Strength Range for Cast Iron in Heavy Sections
Low Silicon Irons (content about 1% Si), tend to fall along upper boundary.
Higher Silicon Irons (about 2% Si), approach lower boundary.
Average Tensile Strength - lb per Square Inch
35,000
30,000
25,000
20,000
15,000
10,000
1 2 3 4 5 6 7 8 9 10
Thickness of Casting, in Inches

Fig. 3—Probable strength for cast iron in heavy sections.

Adaptable Ideas from Pattern and Foundry Practice



TEST gages (Above) being used for setting cores. Each of the jigs is equipped with spring actuated feeling pieces. The setting is accurate when the top of each feeling piece is flush with the top of the jig.

▲ ▲ ▲

THE one-half green core (at Right) is made on the Grimes machine in the center. The dry sand core is located on top of it by means of a location frame. Then the cope hanging in the rear is closed over the dry sand core. The mold is then rolled over, bringing the green sand core on top, as at the right and in the foreground.

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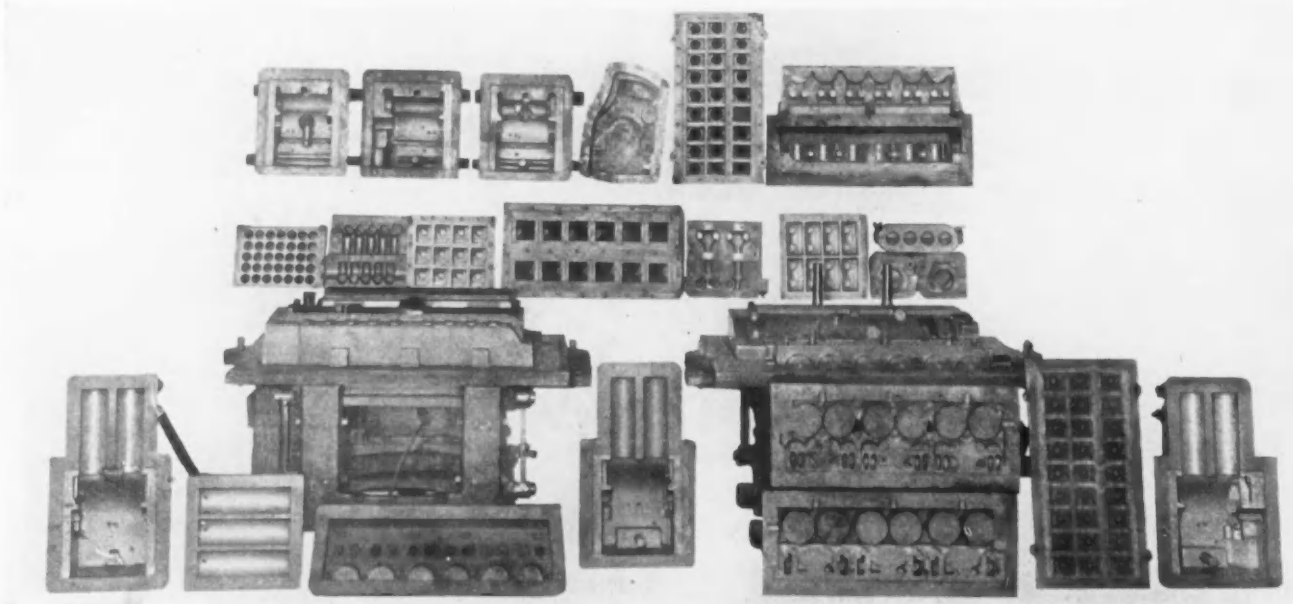
THIS is the outfit (Below) for making the casting for a six cylinder motor. The cope and drag patterns are mounted on the two machines in the center. Twenty seven core boxes were required for making the necessary dry sand cores.



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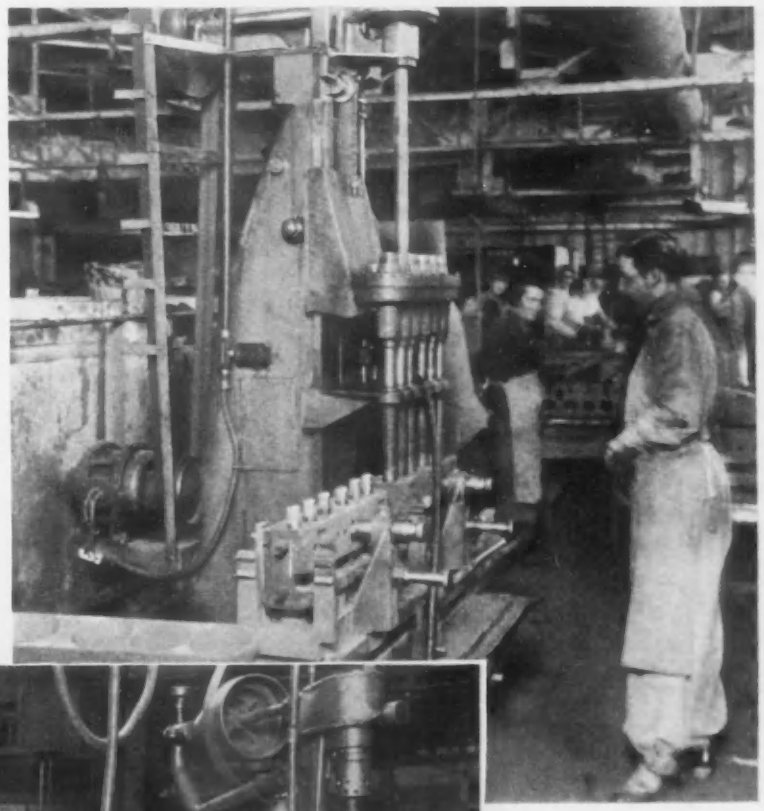
THE accompanying pictures represent current practice in the pattern shop and foundry of the Pontiac Pattern & Engineering Co. Each illustration contains an adaptable idea and is almost self-explanatory. These pages bear out the old Chinese axiom that one good picture is worth a thousand words of text.

▲▲▲

By H. M. LANE



JACKET cores (Above) being reamed in a six spindle boring machine. Abrasive reamers grind the proper diameter and at the same time secure accurate jacket spacing.

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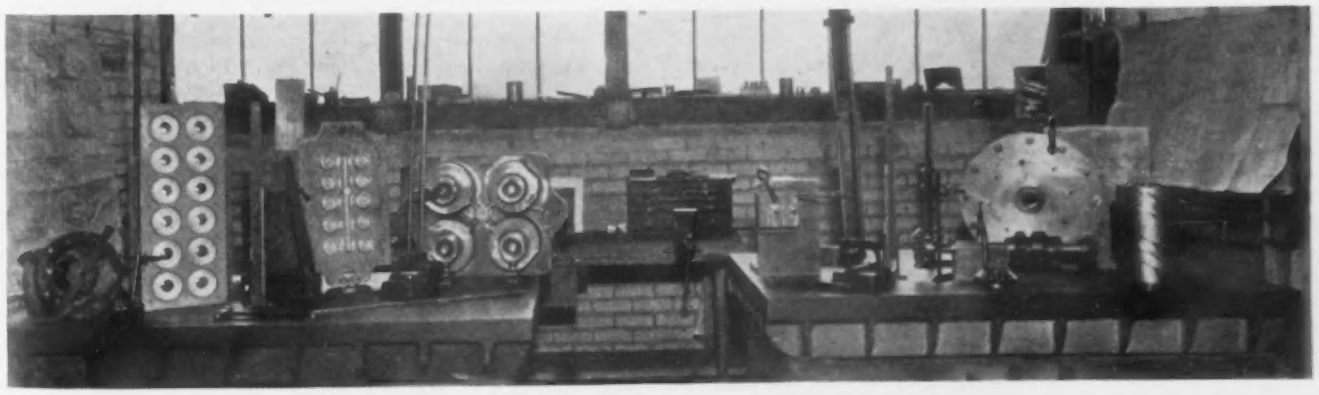
THE grinder at the right, adapted from a drill press, grinds the faces of cylinder cores. The grinder at the left is especially designed for grinding core joints.



Note the heavy surface plates for pattern checking; the drawings suspended for convenient examination; the convenient arrangement of checking instruments and the double rod parallel surface gages.

SAND CONTROL IN THE STEEL FOUNDRY

By A. V. Leun,
Combustion Engineering Department,
Bethlehem Plant,
Bethlehem Steel Co.

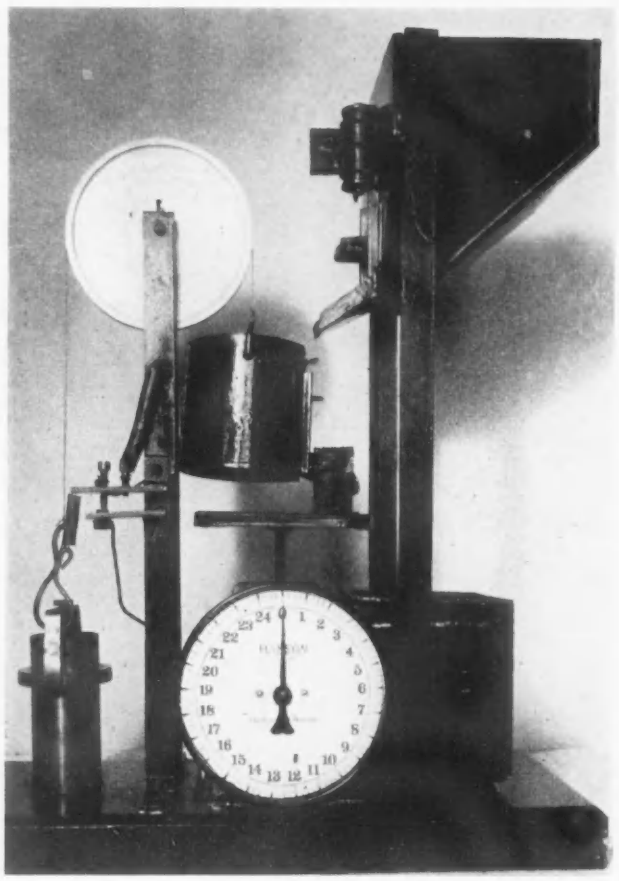


FIG 1.—Apparatus for determining green strength of sand in tension. At the left is Grubb tension cylinder connected by receptacle at center which receives shot from hopper at right, the hopper being controlled electrically by a breaker mechanism giving direct readings on the scale. The breaker mechanism provides an automatic shut-off, eliminating the human element.

IT has been the experience of the writer that the most sensitive and accurate test for green strength in sand is the tension test. Apparatus used in this test is shown in Fig. 1. For determining dry strength, which is the paramount property in dry sand casting, an apparatus pictured in Fig. 2 is employed. In this test briquets are broken. The briquets are made by using the rammer formerly employed in ramming the sand for the bar test to ram the sand into a specially constructed 3-gangue mold shown in Fig. 3. These three briquets are then dried at a predetermined temperature, cooled, and broken in the apparatus which is electrically controlled.

In some cases the dye absorption test is employed, especially on clays. For determining the openness of the sand, the standard A. F. A. test for permeability is used. The moisture content is determined by drying the sand in an electric oven, weighing before and after. Screen tests are made by using the Ro-Tap apparatus in conjunction with a set of screens of sizes to fit the material tested.

The last and one of the most important tests is that used for classifying various clays and sands with respect to their resistance to metallic penetration by the hot metal. This test is carried out by ramming the refractory to be tested into an open mold, 6 x 6 x 8 in. deep, around a pattern, 3 x 3 x 6 in. No wash or other facing is applied to the mold before being dried. After being dried, the mold is poured with steel at a temperature of approximately 2650 deg. F. When it has cooled, the casting is removed and examined for signs of sand burning on. If a new sand or clay is under consideration this test may be run through three times on the same sand, determining by test the loss of strength as well as the change in permeability after each burn.

SAND control in the steel foundry calls, first, for regulation of incoming raw materials and, secondly, for the proper mixing and use of these materials on the molding floor and in the core room. Measures employed by the Bethlehem Steel Co. are described in this article, abstracted from a paper before the American Foundrymen's Association.

Specifications Enforced on Incoming Materials

The materials that go into the making of molds, cores, etc., may be listed as: Sand, both strong and sharp; binders, such as clay, corn, flour, oils, glutrines, etc., and silica flour. It stands to reason that, by maintaining a reasonable and yet enforceable specification on the various materials listed above, we will be assured of a constant quality in the various materials when used in the foundry.

In making our dry sand castings a naturally-bonded, semi-strong sand is used. This material comes from New Jersey and possesses much greater dry strength than does a synthetic sand with an equivalent amount of clay. To keep this product uniform, specifications are placed on it in regard to the percentage of coarse grains. A minimum permeability of 75 is held, and a dry strength of 8 lb. per sq. in. is required when rammed up while containing 7 per cent moisture and dried at 750 deg. F. for 1 hr. This latter specification is the most important, as it assures firm molds when dried and a minimum of cutting when they are poured.

For green sand casting a sharp

sand is employed. It is purchased on screen analysis and on its freedom from impurities such as clay, strippings, etc. It would be useless to give a screen analysis as best suited for all green sand casting. It should preferably, however, be concentrated on one or two screens with a minimum of coarse and also a minimum of fine grains.

Testing the Binders

In testing core oils, corn flour, resin binders, bentonites, etc., the most rapid and yet accurate method is to mix the binder in a specified proportion with a washed sand. Any suitable washed sand will suffice, all that is necessary being to maintain the material constant in screen analysis so that it can always be used as the base in testing the various binders.

The test employed in our laboratory is to mix 4 oz. of the binder with 15 lb. of sand and 5 per cent water. This mixture is mulled in a laboratory muller, or it can be worked up by hand, for 5 min. It is then rammed up into briquets, baked at the proper temperature, depending on the use to which it is to be put, cooled, and tested for dry strength by breaking. The resulting dry strength, when divided into the cost of the binder per 100 lb., will give the cost of the binder per pound of dry strength, and will be an index of the economy of the binder if employed.

Distinguishing Between Good and Bad Clays

Clay for bonding molding sand must possess certain properties, such as high dry strength and high green strength, and must be ground sufficiently fine to be economical in use. To determine the suitability of a new clay for foundry use, it is first mulled with Williamstown Junction sand in the ratio of 15 per cent clay to 85 per cent sand. Enough water is added to give the mix sufficient plasticity. This sand is then rammed into the mold described previously. The mold is then dried and poured, the casting being studied as to its appearance. This test will rapidly differentiate between good and bad clays for foundry use.

In Fig. 4 may be seen a test casting resulting from testing a well known clay. It has been our experience that the fusion point of the clay does not affect the appearance of the castings, provided, however, that the clay is not too full of undesirable fluxes. Also, it appears that the greater the shrinkage of the clay the cleaner will be the resulting castings, possibly due to the pulling away of the mold from the metal face of the casting after pouring.

The plasticity of the clay or its ability to bond molding sand will be shown by its dye adsorption, which is an indication of the colloidability of the clay. The dry strength developed by the clay when used in conjunction with sand and baked at a certain temperature will be indicated by the dry strength of the clay itself, dried at the same temperature as it will be subjected to in the foundry. This dry strength of the clay is best determined by ramming the clay into briquets, drying at the proper temperature, cooling and breaking. A specification for clay to be used in molding and which is in effect for our steel foundry follows:

> The clay is to be finely ground. When worked up into plastic form, molded into standard briquets and baked at 600 deg. F., the dry strength in tension must be not less than 40 lb. per sq. in. The dye absorption must not be less than 1800. The clay must not vitrify at a temperature less than 2300 deg. F.

By the adoption of the proper clay, possessing good cleaning qualities, high dry strength and high plasticity, a minimum of clay will have to be used to give the necessary green and dry strengths to the sand. This will aid in keeping the sand from "closing up," due to continued use and accumulation of burned out clay, etc. Many clays lose their dry strength at temperatures as low as 500 deg. F. These clays, while giving clean castings, necessitate the use of a greater amount of clay to get the desired strength. This is neither economical nor good practice.

Specifications for Silica Flour

Silica flour has two uses in the foundry. It is used in addition to molding sand and core sand to present a tighter sand body to the hot metal where heavy sections are encountered and penetration is to be kept to a minimum. It is also the basis of the mold wash used extensively on dry sand molds to close the surface to the molten steel. For the first use it is not necessary that the flour be as fine as when it is to be used for mold wash. Many foundries use the so-called 140-mesh silica flour for this job. A satisfactory specification for this grade of silica flour is that 95 per cent pass the 200-mesh sieve.

For mold wash, air-floated silica flour is commonly employed. This grade of silica flour allows for a lesser proportion of deflocculant or other material for maintaining it in suspension. It also greatly decreases the settling of the material if forced to stand overnight.

The mold washes used in various foundries differ. Some add bentonite and molasses, others add a corn flour, glutrine, etc. However, a small amount of bentonite, together with a small proportion of a corn flour, when added to the silica flour and water, will give a wash possessing sufficient suspension qualities and sufficient tenacity so that it cannot be rubbed off of the mold surfaces after being baked. The best method of controlling silica mold wash is to maintain it at a constant specific gravity. This can easily be done by the use of a hydrometer, suspending it into the wash and noting the reading.

A good range in which to hold the wash for best results is between 1.350 and 1.420. The best wash will not prevent metallic penetration, however, if the sand is not refractory enough, the mold improperly made, or

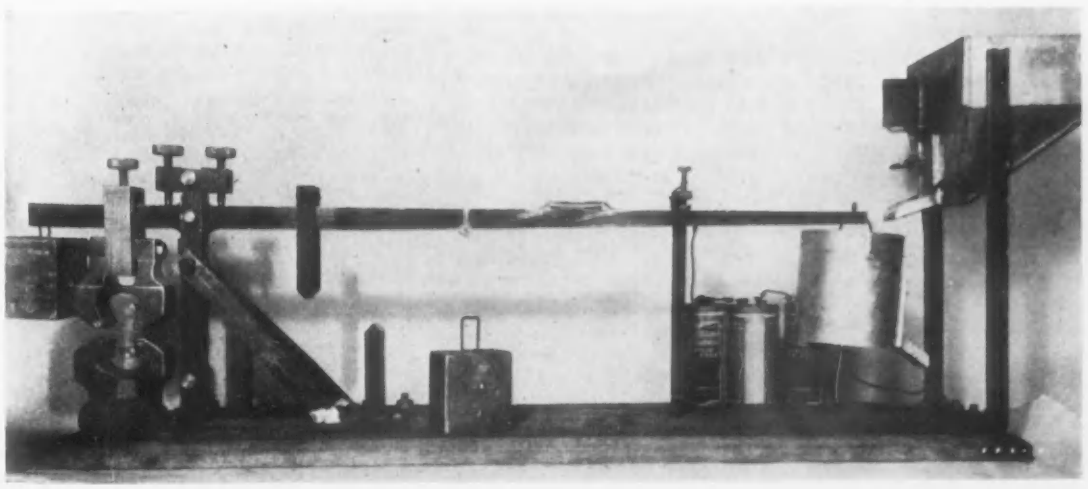


FIG. 2 — Apparatus for determining strength of sand in tension with same type of breaker mechanism as in Fig. 1. Note that a spring here is used to take care of the deflection of the beam. In case of weak sand the bucket is hooked on the middle of the beam and fed by hand. The normal ratio from the tip of the beam to the testing point is 1 to 10. The standard briquet mold is employed, giving 1 sq. in. at the smallest cross-section of the briquet.

the metal poured too hot or too rapidly.

Sand Control on the Foundry Proper

Having a close control over the incoming materials, attention must be paid to the proper mixing and use of these materials in preparing the various molding and core sands.

In a steel foundry making castings in dry sand the most important property to control with reference to the sand is the dry strength. This dry strength depends to a great extent on the amount and the type of binder added or in the sand. It has been found that for all classes of work the dry sand strength should not be less than 10 lb. per sq. in. In most cases it usually is as high as 15 to 20 lb. per sq. in. Where the dry strength falls below this figure the chances for cutting, washing and dirty castings are greatly increased. This dry strength is determined by ramming the sand sample into briquets, as described before. The addition of 30 per cent of silica flour will decrease the dry strength from 20 lb. to 15 lb., or in that ratio.

Not Necessary to Test All Batches of Sand Mulled

When close control is held on incoming foundry refractories and the same mix of materials is maintained, it is not necessary to determine the dry strength on all batches of sand mulled or otherwise mixed. It is originally necessary to set up a mix for dry sand molding, however, having the proper dry strength as outlined above. In the steel foundry of the Bethlehem Steel Co. at Bethlehem we do not check all batches of sand. Only occasional mixes are tested. It has been found that by the control exercised over the raw materials entering and by the maintenance of constant mixes in the shop, a satisfactory dry strength is easily maintained over a long period of time. This has been proved in actual test.

The dry strength developed is dependent, besides the sand and binder, on the amount of water present and the intensity of mixing. As the water content does not have to be closely controlled, it is comparatively simple to train an operator to keep the sand within reasonable limits by sense of feel. The average water content of sand prepared for dry sand molding generally averages between 7 and 8 per cent. To go below 7 per cent is to cause a reduction in dry strength dependent on the deficiency of water. The wetter the sand, up to about 9 per cent water content, the greater the dry strength. This high water content, however, namely, above 8 per cent, makes the sand less workable, causing increased difficulties in drying and adding to the drying cost.

The green strength maintained on such sand is dependent on the dry strength aimed at. When the dry strength is 15 to 20 lb. per sq. in., the briquets being baked at 750 deg. F., the green strength will average between 1.75 and 2.5 lb. per sq. in. in tension. It is generally not necessary to bother with the green strength, as the sand to have a high dry strength will always have sufficient plasticity to make it workable.

Permeability, while of paramount importance in green sand molding, plays a minor part in dry sand casting. It is true that the more open the backing and facing sands, the easier and faster will the molds dry in the oven, but it is also true that the heavier the metal section the more compact and dense must the facing sand be. This is brought about by the addition of silica flour in amounts ranging from 10 to 50 per cent. In such cases, the permeability decreases rapidly. To maintain an open backing sand is an advantage.

This requires special equipment for removing the "fines." This apparatus is far more important when green sand molding is in the majority. In the average shop, specializing in dry sand jobbing work, the permeability of the sand will usually run from 10 on heavy work to 55 to 100 on light-medium castings. When the sand is dried, however, this permeability increases in all cases, often as high as 100 per cent over the permeability of the sand when in the green state.

Permeability Important in Green Sand Casting

For green sand casting careful watch must be kept over the permeability, moisture content and green and dry strengths of the sand. The higher the permeability, provided the green and dry strengths are maintained satisfactorily, the sounder will be the castings produced. The maximum permeability obtained is dependent on the sand employed and the binder added to it. The maximum permeability maintained in practice is dependent on the degree of cleaning the old sand receives and on the surfaces of the castings produced. Where facing sand is employed, its permeability is limited by the openness of the backing sand, as it is useless to maintain an open facing if the backing up material is of much lower permeability. For the individual shop the best permeability is arrived at by keeping it as high as possible, yet getting clean and moderately smooth castings. Provided the refractoriness of the sand is right, rough castings mean too open facing sand, which must be corrected by either adopting a different base sand or blending a finer sand with the one in use.

For green sand casting a sharp sand is generally employed to which is added sufficient corn flour, bentonite, clay, etc., to produce the necessary green and dry strengths. It is necessary that the water added be controlled very closely. The best moisture content for a particular shop making green sand castings depends on the base sand employed as well as on the binders added. It is best determined by test and observation. In most cases, however, the water contained in the prepared sand will average close to 5 per cent. If the mois-

FIG. 3—Special three-gangue mold for ramming briquets for dry strength test.

FIG. 4—Test casting showing the "burning on" effect of a clay used widely in steel foundries. Fusion temperature, 3040 deg. F. Dry strength, 20 lb. per sq. in. Dye adsorption, 1450.

ture content goes much below that set for best results, the resistance of the sand to vibration, and when being poured, to erosion will be greatly decreased. If, on the other hand, the moisture content is too high, "cold shorts," "blows," and scabby castings may result. A simple method of testing for the water content in the sand is to dry out a known weight of it at 212 deg. F., weighing after drying and determining the moisture content by the loss of weight.

The samples taken from that prepared in the shop should also be tested for permeability, green strength and dry strength. These tests take about 5 min. apiece, barring the time taken for drying out the briquets for the dry strength test. This time is 1 hr. These three variables are seldom out of line if a constant mix is maintained.

Correcting the Moisture Content

The water content occasionally falls outside the limits set and the sand must be corrected before being used. In one shop the sand and binders are mulled to properly mix them and the mixture is then tempered. It is then placed in large steel boxes, holding about one ton of sand each. This sand, not being required for use for several hours, is tested as outlined above. If it meets the specifications set up for it, it is passed on for use. However, if the sand is too wet, etc., it is remixed to remedy the condition before going to the molding floor. The tests described are performed as outlined at the beginning of this paper, with the apparatus shown on Fig. 1.

Selecting Binders for Green Sand Facing

Depending on the use to which the green sand facing is to be put, the proper binders are added to it. If the molds are to be finished soon after being rammed, the use of a corn binder for producing green strength, in conjunction with a clay or bentonite, is satisfactory. If, however, the molds must remain open for any length of time before being "finished," the corn flour will have dried and the sand will not take water appreciably. This makes the "finishing" very difficult. Under such circumstances, for proper sand control, the choice of a dextrin to replace the other type of corn flour is necessary. This retains its moisture much longer than will the corn binders for obtaining green sand strength. Therefore, before mixing the sand the operator should first find out how or when the sand is to be used, adding the proper binders accordingly.

Dry Strength of Sand in Green Sand Casting

In green sand casting, as in dry sand work, the dry strength of the sand is very important. If we maintain sufficient green strength in the sand to make it workable we will generally have the proper dry strength. From comparisons made in the foundry, a minimum dry strength of 7 lb. per sq. in. is necessary for clean castings. The test briquets are baked at 400 deg. F. Below are tabulated several actual tests made on sand mixes used successfully for green sand casting:

Type of Work	H_2O	Perm.	Gr. Strength in Tens., Lb.	Dry Strength in Tens., 400 Deg. F., Lb.
Light-simple steel..	5.1	100	1.0	9
Medium-mang. steel	5.0	300	1.75	22
Medium-heavy, simple steel.....	4.8	150	1.50	13

Core-Room Sand Control

The control exercised in the core room is best divided into heavy and light-medium steel castings.

When making cores for castings having heavy sections or where the core will receive considerable punishment from the hot metal, a refractory, dense and fairly hard facing for the core must be employed. Such a core sand facing will generally run between 30 and 45 lb. per sq. in. dry strength, the briquets being baked at 550 deg. F. Its permeability will be low, due to silica flour being added. The backing sand for this strong sand is open but weak, testing about 3 lb. per sq. in. dry strength. Control for this class of core sand is best carried out by careful choice of the core binder, together with the percentage used and the proportion of silica flour added to the sand.

Since cleaning is paramount, the use of old sand, especially that containing any quantity of "fines," is often not economical. Close touch should be kept with the cleaning floor and changes made in the core sand to get the best and easiest cleaning mix. Several mixes used with good results on heavy and medium heavy castings are:

Medium-heavy castings:

20 parts strong sand—new
4 parts silica flour
1 part resin binder

Heavy castings:

10 parts strong sand—new sand
12 parts silica flour

Core Sand Used for Light Castings

For light or medium-weight castings, where the metal sections are not heavy enough to resist cracking on cooling (due to the failure of the surrounded cores to give or lose enough of their strength to weaken them), a different type of core sand must be employed. For this class of core sand many foundries employ oil sand, while others use the regular core sand mix minus the silica flour, which always tends to make the core more resistant to deterioration under heat. In this latter case the dry strength of the core sand when baked at 550 deg. F. will average between 15 and 25 lb. per sq. in. In the case of oil sand its dry strength baked at 400 deg. F. will be between 40 and 65 lb. per sq. in. The ratio of oil to sharp sand for satisfactory cores depends to a great extent on the type of oil used, i.e., the quantity of linseed oil in the core oil employed.

It is seldom necessary to add silica flour to oil sand for metal thicknesses less than 2 to 2½ in. To exercise control in this class of core sand one must first determine the most economical oil to employ, set up a specification on it and enforce it on future shipments. The mixing of the sharp sand, oil and additional binder to give dry strength should be controlled with respect to the percentages of oil and binder added and the percentages of water employed. Here, again, the dry strength is the important test to use as a guide.

When mixing sand, oil, corn flour and water it is best practice to mix the sand, oil and water first and then when the oil is thoroughly mixed in the sand to add the corn flour. This will develop the green strength more rapidly than any other order of mixing. The choice of binder is determined on the basis of the one best suited to the shop conditions and most economical.

Testing a Core Mix

A good test to determine the ability of a core mix to break down sufficiently to relieve strains in a casting and one which has worked out satisfactorily in connection with core room practice is as follows: Ram the core sand into briquets in the regular way. Make two sets of briquets. Bake one set at 400 deg. F. and the other set at 1200 deg. F. for 15 min. Allow these briquets to cool. Then break them in the dry strength apparatus. Care must be taken not to break the cores by handling in placing them in the test machine, particularly those baked at 1200 deg. F. The set baked at 400 deg. F. will show the strength of the cores when placed in the molds, preliminary to pouring. The set baked at 1200 deg. F. will show the loss in strength that may be expected in the core after being surrounded by the molten metal. If this strength is still over 3 lb., trouble may be expected in cracked castings. This test is only meant for application on light-section work, or where the "setting up" of the steel is so rapid that very little time is allowed for destruction of the core binder.

As a result of recent developments in the forging of monel metal rods, shafts, spindles, etc., in large diameters at the plant of the International Nickel Co. at Huntington, W. Va., it has been possible to further increase the range of physical properties of such material, says the company. Engineers are now able to secure a uniform yield point in excess of 70,000 lb. per sq. in. with an ultimate tensile strength over 90,000 lb. per sq. in. on forged bars from 3 in. to 6 in. in diameter. Elongation value averages higher than 25 per cent.

How Buick Machines Its Crankshaft

By BURNHAM FINNEY
Detroit Editor, THE IRON AGE

MACHINING of the cylinder crankcase and of the camshaft at the Buick Motor Co., Flint, Mich., was described in previous articles.* Machining and assembly of the Buick crankshaft are set forth in this article.

The crankshaft is milled to length on a rotary mill and the ends are centered on a special centering machine. The three center bearings then are straightened on a hydraulic straightening machine, after which the crankshaft is checked for straightness and the index of the pins checked with a dial indicator. The next operation is the forming and facing of the three center bearings on a special crankshaft lathe equipped with three back forming tools and tools and holders for the thrust bearing. The bearings again are straightened on a special straightening machine to within 0.01 in.

Following the straightening operation is the rough turning of the flange oil deflector, front and rear bearings and the balancer seat on a No. 4 center-drive lathe and the rough grinding of the center thrust bearing on a 12 in. x 36 in. grinding machine. The two center bearings then are finish turned on a No. 4 A. C. center-drive lathe, thence passing to a straightening machine where the three center bearings are straightened to within 0.003 in.

The two center bearings are semi-finished on a 10 in. x 48 in. hydraulic grinder, the diameter of the front center bearing being held within limits of 2.388 in. and 2.390 in. and the rear center bearing to limits of 2.513 in. and 2.515 in. All front and rear bearings are semi-finished on a hydraulic grinder, the diameter of the front bearing carrying a tolerance of 0.002 in. and the rear bearing 0.001 in.

Locating spots are milled on a traveling milling machine and all pins rough and finish turned on a No. 5 A. C. crankshaft lathe. After going through another straightening operation for the three center bearings, the balancer seat is rough milled on a hydromatic milling machine with a special fixture for the work. Tops of the weight pads are milled on a vertical miller and the lock is milled on a special miller. The milling of the lock pads follows; then the lock pad and balancer seat are checked on a special fixture.

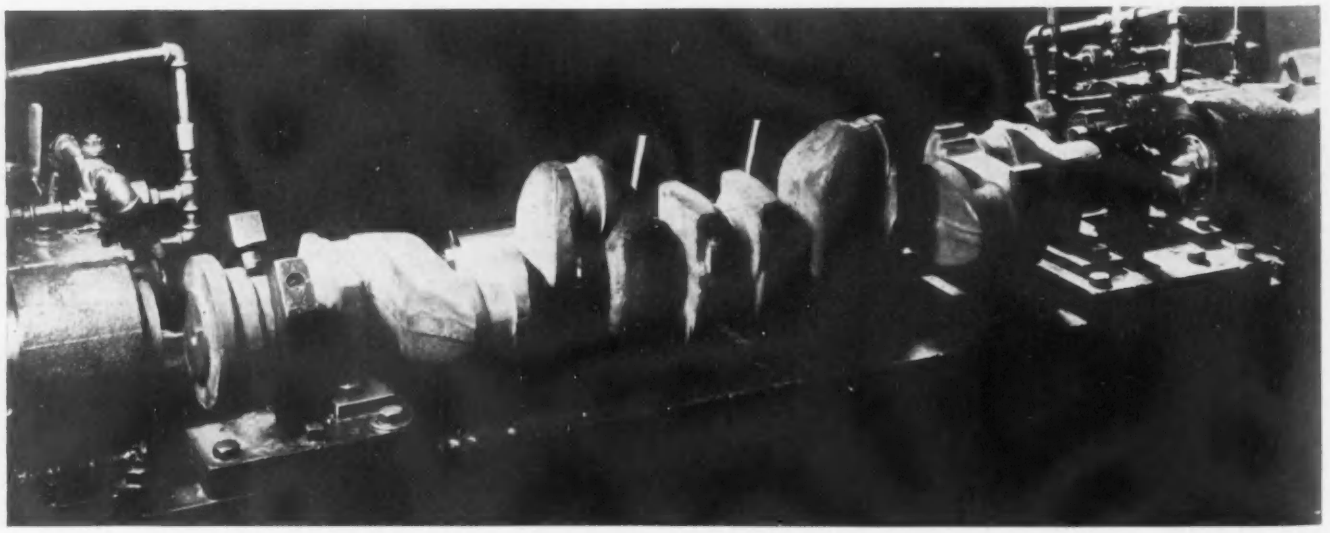
Weight pads are drilled on a battery of 24-in. drill presses. Stud holes are reamed, chamfered and tapped on these drill presses. Crankshafts then are washed and blown out in a tank, the shafts being held in the tank on racks. After being checked, crankshafts are sent to special drills where 3/16-in. oil holes are drilled. They then pass to a battery of drill presses to have 11/32-in. oil holes drilled in all pins and bearings. These presses have special fixtures for removing the chips from the oil holes. Another straightening operation follows on the three center bearings on a special straightening machine.

Bearings and Pins Finish Ground

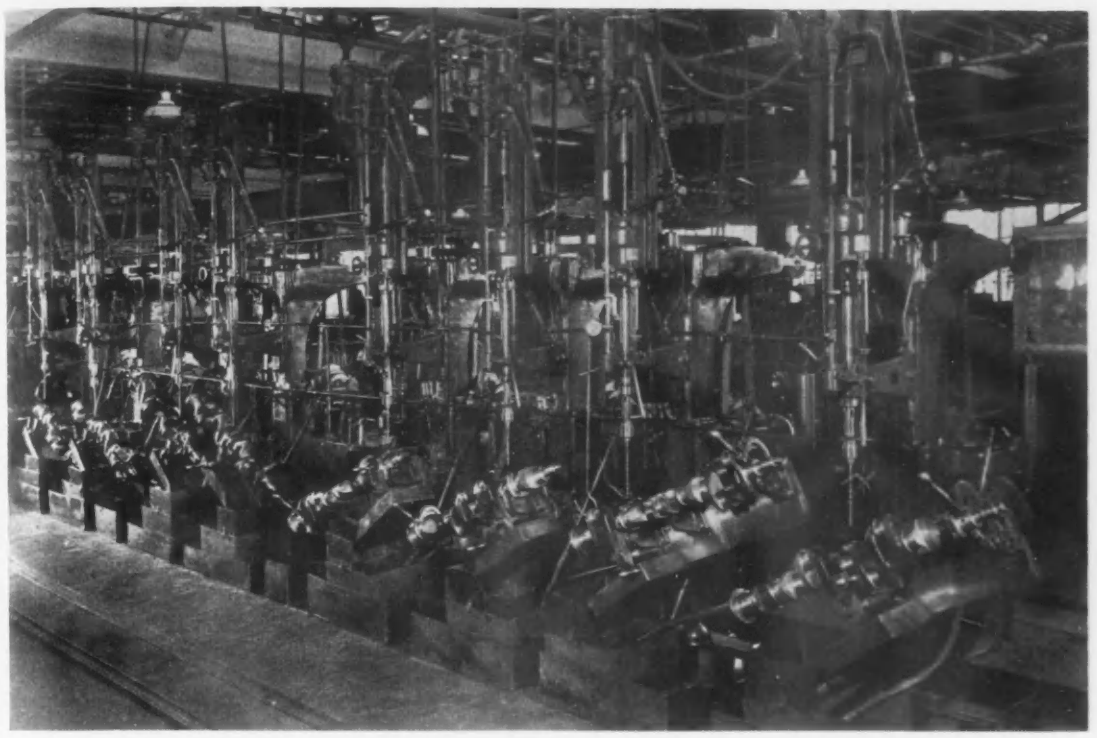
The thrust bearing, rear center bearing, front center bearing and the front and rear bearings are finish ground on a battery of 10 in. x 48-in. grinders. Again the three center bearings are straightened, this time to limits of 0.004 in. All pins are finish ground on a battery of automatic hydraulic grinders. After the center bearings are straightened, the width of the balancer seat is finish turned on a multi-cut lathe and the balancer seat finish milled on a hydromatic miller.

The clutch pilot hole is drilled on a 24-in. box-type drill and four screw holes are drilled, reamed and tapped on 21-in. drill presses having two-

*March 31, page 768 and April 7, page 828.



The ends of the crankshaft are centered on a special centering machine.



OIL holes are drilled in the crankshaft on a battery of drills equipped with hydraulic automatic control.

spindle drill heads. The flange face and pilot are finish ground on 12 in. x 36-in. grinders, while the pilot hole is rough and finish bored and reamed and the flange chamfered on an automatic screw machine. The rear bearing and the pulley bearing are finish ground on a 12 in. x 36-in. grinder. Flange holes are drilled and reamed on 24-in. drill presses, after which an operator using a hand miller cuts the keyway in the gear and pulley bearings. The oil groove is finish ground on a 12 in. x 36-in. grinder and the threads are milled on a thread milling machine. Oil holes are burred and blown out, burring tools and scrapers being employed for this purpose. All pins and bearings are then burred on a speed lathe.

Pins and Bearings Lapped Rapidly

Pins and bearings are lapped on two crankshaft lapping machines. For this work the crankshaft is placed on supporting blocks on the table of the machine 28 in. from the floor and raised mechanically into proper alinement with the clutch sleeve, drive-pin and footstock center. After the lapping arms are clamped and the locking lever released, the lapping operation is started. The reverse of this procedure is followed in removing the crankshaft. The lapping arms for the main bearings are suspended from a shaft directly above the work centers and are stationary; the lapping arms for the crankpins are mounted on a shaft above and to the rear of the work centers. They are counterbalanced and swing on anti-friction bearings.

A bonded abrasive paper is used as the lapping medium. The tank for the lubricant (kerosene) is held in the footstock end of the base of the machine; the kerosene is distributed to the lapping arms by a direct-connected, motor-driven, centrifugal pump, with anti-friction spindle. The machine is driven by a 5-hp. motor mounted in the base directly below the headstock.

During the rough and finish lapping operations approximately 0.0005 in. of stock is removed. Each of the two operations on each crankshaft takes about 1½ min., so that one machine can turn out 20 completely lapped crankshafts an hour. All levers for starting, stopping and regulating the speed of the work are grouped on the headstock, which is bolted to the machine base. There is an adjustable reciprocation which moves the crankshaft endwise from zero to ⅝ in.

Studs Welded to Counterweight

After the crankshaft has been lapped, it is put through a final straightening operation and then is rigidly inspected. At this point the crankshaft assembly begins. The spring seat blocks are assembled to the crankshaft and the studs driven into place. Assembly of the counter-

(*Concluded on advertising page* 20)

Pins and bearings are lapped on a crankshaft lapping machine.

Steel Foundries Gird Themselves for Future

(*Concluded from page* 1105)

improved their facilities and pursued a policy of constructive selling, designed to develop future and new business.

Added capacity is being held down, if not actually reduced, and as a whole, the industry should emerge to occupy a stronger and more influential position in the field of steel production. Much depends, however, upon the willingness of those directly responsible for management to cooperate with others in the business to meet and solve the destructive problems now wasting the industry's energies and resources to an extent that, if allowed to continue, will force many companies into bankruptcy. Price structures must prevail that show a reasonable profit above actual cost, so that invested capital will be safe, stockholders' interests provided for, reasonable wages maintained, with some continuity in employment.

Cooperatively, the industry must recognize that much of its future, if to be successful, is based on the finding and development of new uses and applications for the product. Merchandising and selling methods will have to be further improved along with the technical progress of the industry which, in the past two decades, has been rapid.

Electric Furnaces in the Foundry

By G. L. SIMPSON

Pittsburgh Electric Furnace Corpn., Pittsburgh

LOWER selling prices and a drastic decline in production have resulted in several very noticeable trends in the use of the electric furnace in the foundry.

Of a special interest has been the tendency for plants that have both open-hearth and electric furnaces to shut down the open-hearth and make all of their work in the electric. It has proved very expensive to keep an open-hearth idle and hot just to be in readiness for small orders that may come in. We know of at least one plant that has installed an electric furnace in the last few months for just this reason.

The "bleeder type" furnace of comparatively small capacity, which can be connected to the present electrical substation equipment of larger electric furnaces, has attracted the attention of some plant managers. When business picks up the bleeder furnace will come in very handy for melting up alloys to make special heats in the larger furnace or for meeting the needs for a small production of some special alloy steel or iron, sandwiched in between the operation of the big furnace on its regular production.

Within the last two years several small electric furnaces have been installed for experimental work on high-test or alloy irons, preliminary to installing larger furnaces and introducing a new product when times become more normal.

We know at least one or two companies which have actively introduced new products in these times and have installed electric furnace equipment to do so. Automotive brake drums are an example.

Other companies are paying special attention to increasing the efficiency of their furnace operation. They are seeking to improve the power factor of some of the older installations and are installing demand control devices, all with a view toward melting at the least practical cost for power.

Developments in the Gray Iron Industry

By ARTHUR J. TUSCANY

Manager, Gray Iron Institute, Inc., Cleveland

DURING a period of depression the aggressive, far-sighted manufacturer takes inventory of his entire company's set-up and studies each department in the light of what can be done to improve quality, reduce costs, and otherwise render a more thorough and complete service to his customers.

The members of the Gray Iron Institute are following this policy with splendid results. The physical side of the set-up has been improved through the installation of modern machinery and equipment. This job can always be done more effectively when the plant is not crowded to produce the product. More time can be taken and the finished job results in a much more complete and thorough set-up than if the task is undertaken when high production is demanded from the manufacturing organization.

The Gray Iron Institute is completing, during the present period, a piece of work in which the casting user will profit in many ways. The institute is developing through means of test bars furnished by members, a wealth of outstanding information on the quality of the product being produced in member plants.

All of these data have been made available to a special committee of the American Society for Testing Materials which committee, in conjunction with the technical director of the institute, have set up a tentative specification for gray cast iron of different types where strength is a factor. The value of these specifications will be immediately obvious. The designer, engineer and the casting user will have available for their use complete information of the most desirable nature. The proper grade of gray iron will be employed for each type of service, with augmented results in every direction. If the depression has accomplished nothing else for the casting user, it has brought about this very important, much desired development.

The Gray Iron Institute, through its technical department, is supplying its members with specific information enabling members to set up shop standards so that the quality of the product can be controlled and studied very closely. This work insures an improved, uniform quality, if the casting buyer is fortunate enough to have as his source of supply a gray iron foundry working under institute standards.

Many member companies of the Gray Iron Institute have employed the time available, due to the lower levels at which business is operating, to develop new products and new uses for gray cast iron. The designer and other buyers of castings have had many savings brought to their attention through this work, and the quality of the finished product has been immeasurably improved through the use of gray iron parts which are more efficiently serving industry.

The progressive manufacturer who realizes that modern gray iron offers opportunities not previously available is profiting in many directions, among which are reduced cost and improved quality.

Production of fuel briquets in 1931 was 698,316 net tons, valued at $5,260,585, a decrease of 32.1 per cent in tonnage and 34.5 per cent in value from the preceding year. Imports in 1931 were 60,950 tons, a drop of about 17 per cent from imports in 1930.

A Pictorial Interpretation of The Spirit of the Foundry

THE remarkable pictures reproduced upon this and the following pages present a dramatic interpretation of the spirit of American foundry practice: the romance of sand and hot metal.

Starting with these two tense melters, intent upon the service of their molten charge, we follow, with John P. Mudd, of The Midvale Co., who made these striking photographs, the major steps in the birth of a sound casting.

MODERN mechanization has not banished the element of human skill from foundry practice. The foundry is still a stronghold of craftsmanship and self expression. Even this young apprentice is exhibiting the pride of personal service that is inherent in all true foundrymen. ▲▲▲

AND this master molder, whose delicate and trained touch is engaged in "slicking up" this drag, does not exhibit the look of one bored by the monotony of repetition. For there is infinite variety in the behavior of sand as well as of iron and steel, and skill must cope with the unexpected.

▲ ▲ ▲

SHOOTING stars of oxidizing particles, miniature meteors in fact, stage a pyrotechnic display to accompany the metamorphosis of swift running iron from quiescent pig. ▲▲▲

AND then, guided by careful movements of craneman and ladleman, the eager, molten metal seeks out the far and near interstices of the mold, reproducing, first in liquid, then in solid metal, the form of the pattern.

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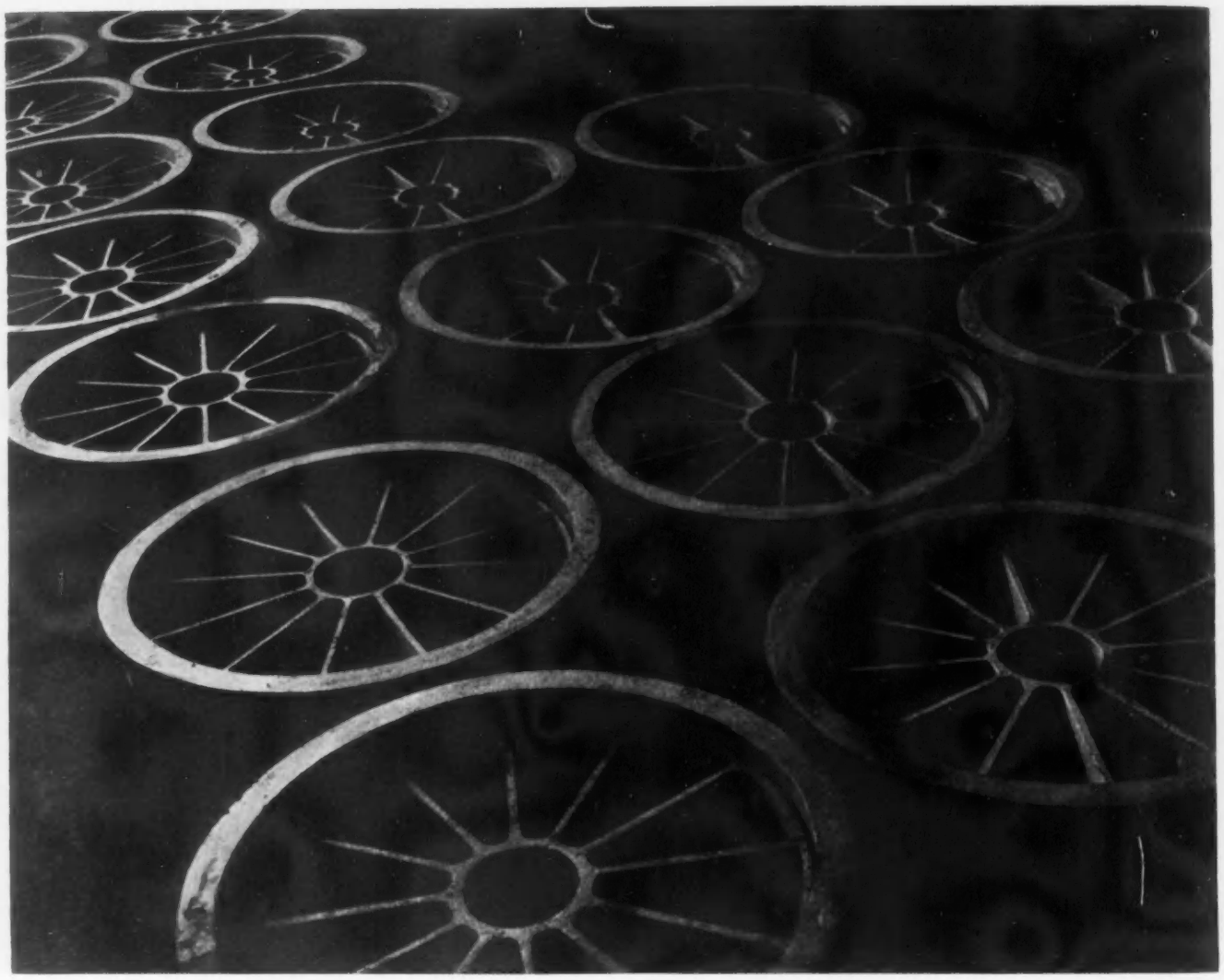

"THE Parade of the Iron Soldiers." Or perhaps we could entitle it "After the Ball Is Over." For the dance of hot metal has been completed, the shake out gang has completed its nocturnal duty and the empty iron flasks come back to the foundry floor for the next performance.

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"TRIMMING His Whiskers." That is what the photographer entitles this picture. It's a stiff beard that must be cut, consisting of fins, sprues, risers and gaggers. But the barber is equipped with appropriate tools and his air driven chippers and grinders will give this huge casting a clean shave.

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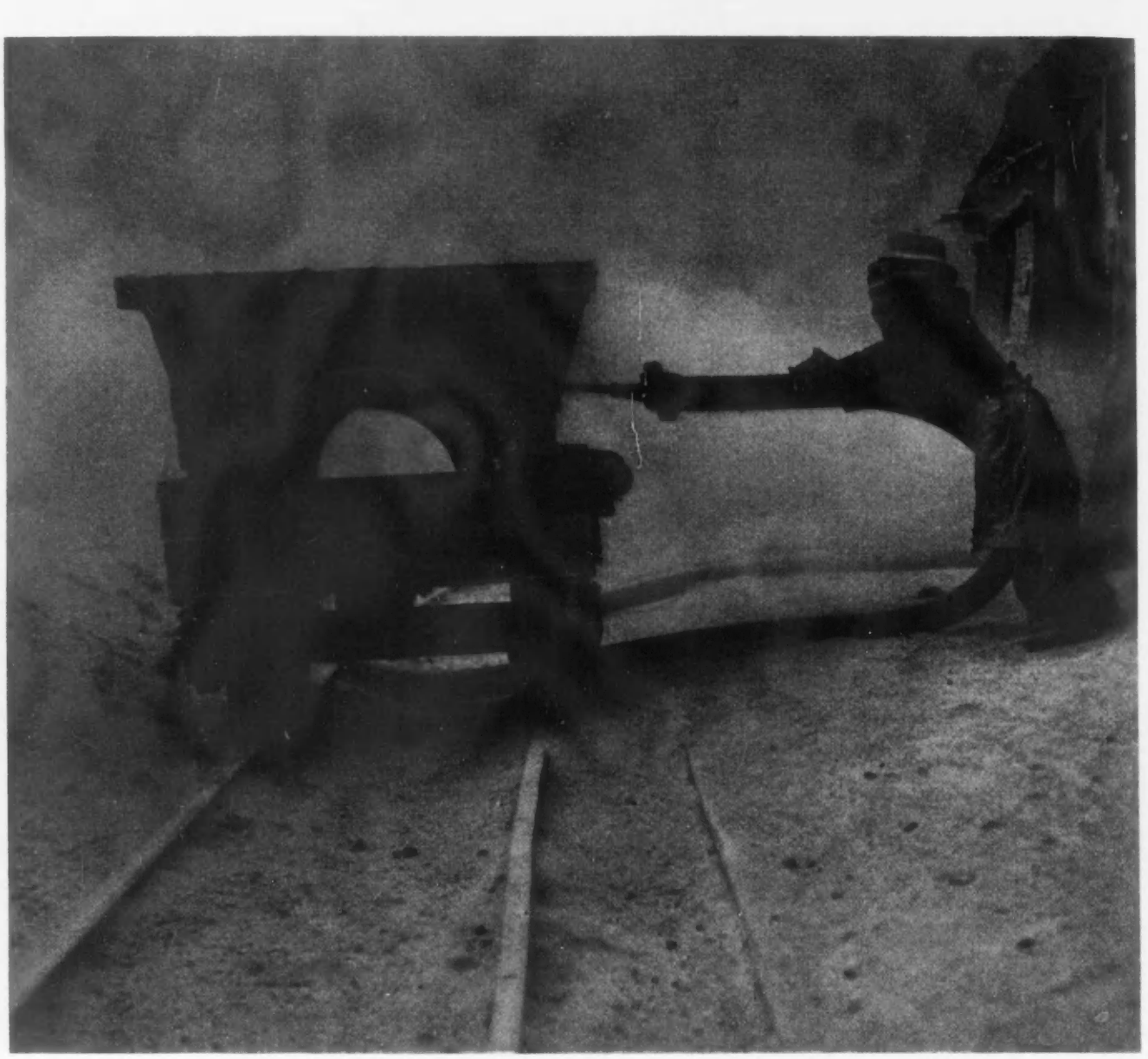


"THE Man Made Sand Storm." Bombarded by millions of tiny grains of sand per minute, the hard crust of the casting yields to superior numbers and is swept away before the furious tornado of the sand blast. But the work is not all done by the hard flying particles. For it is obvious that the man is taking strenuous part also in the battle.

▲ ▲ ▲

Effect of Section on Tensile Strength of Gray Iron

(*Concluded from page* 1107)

considerably below the figure obtained in our exploratory tests.

Six Heats Made and Tested

In order to obtain specific information as to the strength which might reasonably be expected in castings of this size and composition, and of other compositions advanced as more suitable for the service, castings of various compositions and sizes were made and tested. Six heats were melted in the cupola, according to regular practice, using charges of foreign and domestic pig, foundry returns and bought scrap, with additions of 5 to 30 per cent steel, to obtain the desired range of compositions. Test bars and blocks of various sizes from 1 in. to 10½ in. thick, weighing up to nearly 4000 lb., were cast on end from each heat, and the castings were sectioned to obtain specimens for tensile test. In case of the 1 and 2-in. square bars, the tests were taken as nearly as possible half-way from the surface to the center, and in the larger bars tests were taken from near the surface and at the center, and the results averaged. In the case of the 10½ x 30 x 48-in. castings, six specimens were taken from each near the surface and center, at top, middle and bottom.

In these two castings the results were extremely uniform, the maximum deviation of any test from the average being 10 per cent. This would indicate that in heavy castings of simple design, a high degree of soundness and uniformity is attainable. There is reason to believe that in some of the intermediate sizes, where appreciable temperature gradients may exist, this is not so easily possible, even when pumping or churning is resorted to.

The complete range of sizes of test castings is shown in Table I and the compositions of the six heats in Table II. The average tensile results obtained are tabulated in Table III and shown graphically in Fig. 2.

Heat B was intended to duplicate and supplement Heat A, and they are very close in composition, although the natures of the charges were quite different. Accordingly, the tensile results from both heats were used in plotting the lower curve in Fig. 2. Heats C and D were also supplementary, and the results of both heats were used to plot the upper curve. Since only two castings were made from each of Heats E and F, no curve can be drawn, but it is to be noted that the tensile results in 10½-in. sections fall inside the range bounded by curves A and C. The average tensile strengths found for the failed cylinders also fall within the same area.

TABLE I—RANGE OF SIZES OF CASTINGS

Section, In.	Length, In.	Weight, Lb., Approximate
1x1	15	4
2x2	24	24
4x4	24	96
6x6	36	324
8x8	36	576
10½x10½	36	1000
10½x30	48	3800

TABLE II—COMPOSITIONS OF HEATS USED

Heat	Total Carbon	Manganese	Silicon	Phosphorus	Sulphur
A	3.40	0.51	1.94	0.570	0.070
B	3.16	0.45	1.95	0.646	0.108
C	3.18	0.54	1.39	0.240	0.064
D	3.36	0.44	1.40	0.298	0.099
E	3.36	0.43	2.15	0.689	0.101
F	3.87	0.34	1.07	0.095	0.057

TABLE III—TENSILE STRENGTHS OF CASTINGS

Heat	A	B	C	D	E	F
Silicon content	1.94	1.95	1.39	1.40	2.15	1.07
Size	Average Tensile Strength, Lb. per Sq. In.					
1 in. square x 15 in.	33,550	33,700	33,350	32,800	29,200	21,880
2 in. square x 24 in.	20,950	.....	26,550	.....	.....	.....
4 in. square x 24 in.	16,600	.....	20,400	.....	.....	.....
6 in. square x 36 in.	16,150	.....	20,200	.....	.....	.....
8 in. square x 36 in.	9,725	14,275	15,000	21,475	.....	.....
10½ in. square x 36 in.	.....	13,825	.....	15,625	.....	.....
10½ in. x 30 in. x 48 in.	.....	.....	.....	.....	14,700	15,700

While the number of distinct castings made is not as large as might be desired for scientific accuracy, it is nevertheless evident that the strength of castings of different thicknesses follows a fairly definite law, and that the effect of composition is greatly minimized as the section increases. The close grouping of all the results on the castings of greatest thickness, 10½ in., in which the greatest number of tensile tests were averaged, indicates that in large sections, of this order at least, composition plays a decidedly minor part. It is also evident that the cylinders which inspired the investigation were of normal strength for the section and size involved.

With the data available, it is possible to establish a probable strength range for castings of all compositions in heavy sections, and such a range is shown in Fig. 3, for sections of 2 in. to 10½ in. thick.

Effect of Alloy Additions

This range approximates closely the average strength of gray iron in large sections, regardless of composition. For design purposes, the values included in the range are a safer guide than the usual guesses based on test bar strengths. The curves, it should be understood, refer only to cupola irons of the ordinary types, and not to alloy irons or the newer high-test irons. Data on these are scarce, but the experience of the writers indicates that the benefits derived from alloy additions, all-steel charges and superheat may be retained to a greater extent in such heavy sections.

In addition to the tensile strength, the microstructure of the entire series of special castings was investigated. Some characteristic structures are shown in Figs. 4 to 6, all at 100 diameters. In Fig. 4, the coarse graphite-ferrite-phosphide structures of the cylinders is shown. In Figs. 5 and 6 are shown structures of 1 in. square and 10½ x 30 x 48-in. castings of Heat E. The chief cause of decreased strength in the heavy castings is obviously the weakening effect of the coarse graphite flakes. A second and less important factor is the lowered combined carbon of the heavy castings resulting in a low strength matrix and increased graphitic carbon. Figs. 5 and 6, representing a 1-in. square bar and a 10½ x 30 x 48-in. block cast from the same ladle of iron, show in a striking manner the effect of section on the size of the graphite flakes and the amount of combined carbon retained.

International Tin Committee, research and development section, 149 Broadway, New York, has published "Tin—World Statistics" for 1932, which contains data regarding the production, consumption and stocks of tin, together with tables showing the history of price changes. Copies of the booklet will be mailed upon request.

Foreign Steel Undermines Domestic Price Structure

An address by G. L. Lacher, Managing Editor, THE IRON AGE, before the American Steel Warehouse Association, Hotel Commodore, New York, May 18.

"ARE steel imports large?" No, they are not large. Imports in 1931 were smaller than in 1930. In fact, there has been a steady decline in imports since 1928.

But this answer does not dispose of the subject. Examination of the figures discloses that imports of rolled and finished steel products have declined less than domestic production. Whereas in 1928 and 1929 imports of these products represented about 1 per cent of the total consumption in the United States, in 1931 imports accounted for 1½ per cent of that total. Imports last year reached their peak in April, but after that remained at a rather constant level in spite of a steady shrinkage in the consumption of domestic steel.

Finally, analysis reveals that imports of certain finished steel products showed increases, some of them disturbingly large. Imports of steel bars, for example, nearly doubled—the 1931 total being 90,372 tons compared with 48,364 tons in 1930. Barbed wire imports were 10,613 tons as against 4675 tons in 1930. Nail imports were 8106 tons against 6015 tons in 1930. The hoop and band total was 27,991 tons compared with 15,057 tons in 1930.

In the first three months of this year bar imports were only slightly behind those of the same period in 1931 (10,541 tons against 12,852 tons for merchant bars and 8802 tons against 9991 tons for concrete bars) while sharp increases were registered by hoops and bands (5384 tons compared with 4648 tons), nails, tacks and staples (2527 tons against 1837 tons), barbed wire (4276 tons against 1534 tons) and tin plate (2605 tons compared with 37 tons).

Depreciation of Pound Sterling Accentuates Price Slump

Now even these figures would not be disturbing but for an important event that occurred last September, i.e., the suspension of gold payments by England. Abandonment of the gold standard by Great Britain was followed by similar action in other countries. World trade relationships were thrown out of gear and the world price situation was demoralized. Countries remaining on the gold standard were affected no less than those which suspended gold payments. The European steel cartel broke down. The new barriers created by currency depreciation as well as by new tariffs, such as those put into effect by Great Britain, caused Continental countries to turn to America as an outlet for exports that formerly went to England and other nations which had gone off gold. Europe's export prices have steadily declined and today seem to reflect a frantic effort to convert goods into money regardless of costs.

This price offensive comes at a time when the American industry is prostrate, when further price declines point to ruin for stockholders and hunger and destitution for employees.

In a time of prosperity we might not be alarmed to learn that 25 to 40 per cent of the Pacific Coast consumption of bars, light structural shapes, and wire products was supplied by foreign mills or that in the New York metropolitan district 25 per cent of the sales of bars, structural shapes, universal plates and floor plates, in active sizes, represented imported material, but today such a situation represents a real menace.

Can Ship Foreign Steel to American Mill Doors

Prices on foreign material have reached a point where steel can be laid down at the doors of American mills at Pittsburgh, Youngstown, Buffalo, Birmingham and Chicago at less than the domestic market.

I have before me a price list of a Belgian broker dated April 16 which quotes various products at ridiculously low figures. The list is headed by steel bars at $11.30 per gross ton, f.o.b. Antwerp. This figures out at slightly more than one-half cent a pound (0.5044c.) at Antwerp, making no allowance for transportation costs from foreign mill to that port. An extra of $3.25 per gross ton, or 0.145c. a lb., is quoted for delivery c.i.f. New York. Adding a duty of 0.3c. a lb. and 0.05c. a lb. for trucking, we get a domicile delivered price in this city of 1c. a lb. as compared with 1.95c. for domestic material. The same foreign material could be delivered at Pittsburgh at 1.35c. a lb. compared with the domestic mill price of 1.60c. in that city.

Such prices do not merely represent dumping—they constitute the unfairest of unfair competition—they represent a conspiracy to raid our market, close our mills, ruin countless stockholders and add greatly to our burden of unemployment.

Where Free Trade Reasoning Lands Us

Most of the theoretical economists, as well as New York bankers who are worrying about their foreign loans, are flooding us with propaganda for free trade. We must lower the bars to foreign goods, we are told, so that other countries can pay their debts to us. But let us face the facts. No payments on those debts are now being made and we have no assurance that payments will ever be resumed. Can we afford to risk ruin to our greatest industry while we are waiting for debt payments that are by no means a certainty under even the most favorable conditions?

Our theoretical friends tell us that world production and consumption would be greatest under a condition in which each country produced what it could produce more cheaply than other countries. For example, Australia can produce wool more cheaply than the United States, whereas we can make automobiles at a lower cost than Australia. If tariff walls were entirely removed we would supply Australia with automobiles and that country would supply us with wool, and a larger production of both commodities would result.

On this basis, the United States should vacate the steel market to Europe, for there is no question that, entirely aside from the fact that dumping is now going on, European costs are lower than ours. And why? With the aid of American capital European steel plants have been modernized and compare favorably with ours. Secondly, and most important, the European steel industry has been built up primarily with an eye on exports. Labor costs have been kept down to a mere subsistence level, because there has been little concern about cultivating domestic demand. In this country, for many reasons which I haven't time to recount here, the

steel industry has grown by cultivating home consumption. This has forced our producers to give a larger share of the fruits of production to labor. Labor has been paid a rate in keeping with the American standard of living. In a word, American employers have learned that labor costs cannot be driven down to the point where labor has nothing left above necessities to buy the products of industry.

European Wages One-Third to One-Half of Ours

Now what are wage rates in European mills as compared with those here? According to the latest available information, common labor rates abroad range from 16c. an hr. in France down to 9c. in Belgium and Luxemburg. These compare with a basic wage rate following the last reduction of 33c. an hr. at Pittsburgh, Youngstown and Chicago.

Of course, it is conceivable that matters might be allowed to drift so that American mills would be forced to reduce their wage rates to levels comparable with those prevalent in Europe. But such action would tend to drag down our whole domestic wage level. That accomplished, American industry might be in an excellent position to compete in an overcrowded international market, but its rich domestic market would be gone. Our great mass production plants, made possible by the American standard of living, would be doomed.

The situation could not be much clearer if European mills were actually operating with slave labor. If Continental workers were slaves, it would not take long for our Government to decide that American labor needed protection. It should be no more difficult to make such a decision when it is a matter of record that European wage rates are only one-third to one-half those prevailing here. It may be argued that the cost of living is lower abroad and that real wages are actually no lower there. But this contention does not hold water. It has been demonstrated time after time that living standards in this country are higher than those abroad.

Are European Tariffs Low?

We are continually warned against economic isolation. America must buy from other countries if it would sell them, we are told. But what particular economic advantage is there in having the steel producing nations take in each other's washing? The European nations have no illusions on this point. It is true that they constantly harp on our high tariff. But do they themselves have lower tariffs? Not so you could notice it. To cite a few examples, Germany levies duties of 53c. a 100 lb. on structural shapes, 27c. a 100 lb. on bars and hoops and 32c. a 100 lb. on plates.

France has a duty of 39c. a 100 lb. on bars and 45c. on plates. Now what are some of the American duties? Barbed wire, which it will be recalled is coming into this country in steadily increasing volume, is duty free. Shapes take a duty of 20c. a 100 lb., bars 30c., hoops and bands 25c., and so on.

But I have not finished with the French restrictions. In addition to duties, France levies a surtax of 4 per cent, which is applicable on all semi-manufactured products. But the duties and the surtax do not tell the whole story. France quarterly announces monthly quotas on various products. For example, for the period from March 20 to June 30 monthly quotas for iron and steel blooms, billets and bars were fixed at 2956 metric tons for imports from Germany and Belgium and at only 19 metric tons for imports from all other countries combined, including the United States.

Why European Countries Protect Their Steel Industries

European countries, Great Britain included, believe in protecting their iron and steel industries. Why? Because iron and steel is the first line of national defense; because iron and steel provides employment when industrial idleness is the gravest problem of the day. Those reasons apply with equal force to our own country. In fact, it is high time that we Americans definitely abandoned sentimentalism for realism. We have learned enough about world politics since the war to know that the age of perpetual peace has not arrived. While we abhor war and all that goes with it, we know that we must be prepared for eventualities. For the sake of security alone our iron and steel industry must be protected.

Price Savings More Than Offset by Unemployment

But aside from that important consideration, the iron and steel industry should be protected to prevent a further increase in unemployment. If foreign steel could be bought for nothing, it would still be short-sighted economy to permit it to replace the products of American mills in our markets. What we gained in price would be more than offset by the increased burden of idle workmen, who must be taken care of in some way—by employer, municipality, State or nation. In fact, the immediate result of any further decrease in American production as a result of increased steel imports would be to shift the burden of caring for employees from the steel companies to public authorities. At 20 to 25 per cent operations our steel companies are at the minimum rate at which they can effectively rotate jobs to take care of a maximum number of employees. Lower production would force wholesale dismissals. Moreover, it would force American steel companies to abandon expenditures for food for those employees which they have had to dismiss. One independent's expenditures for food for former employees last month totaled $35,000.

Must Measure Imports in Terms of Work

The magnitude of the employment problem in our iron and steel industry is realized when it is recalled that the maximum payroll in 1929 was nearly 400,000 wage earners. If no rotation of jobs had been resorted to, present operations, at about 25 per cent of capacity, would mean that 300,000 men had been put out of work. Assuming that each workman has three dependents, this amount of idleness translates itself into 1,200,000 people without the wherewithal for subsistence.

But the problem does not stop there. We must consider the butcher, the baker, the grocer, the clothier, the shoe merchant, the physician and all others who gain their livelihood by catering to the needs of these workmen and their families. Moreover, our hard-pressed railroads are vitally interested. If foreign steel is imported the railroads get no more than one haul from seaboard to destination, and they are not entirely sure of that, since foreign shipments have been moved by river barge and Great Lakes steamer. In the case of domestic steel, however, the railroads are called upon to handle 6 tons of raw material for every ton of finished steel made.

Charity begins at home. It is true that Uncle Sam has played Santa Claus so long that he still imagines that he can extend a helping hand to our complaining brothers across the Atlantic. But at this stage of the depression such generosity is pure folly. Millions of Uncle Sam's own people are idle and in want. They demand and should get his first consideration, and when he peruses the steel import figures, he should measure them not merely in tons but in terms of work.

Recently figures were released and computed to show the effect on any community when 1000 tons of finished steel a month is manufactured at an American mill.

The figures follow:

*Manufacturing Disbursements in Producing 1000 Tons of Sheet Steel**

Raw material	$22,500
Wages	18,800
Fuel oil (15,300 gal.)	3,200
Electric current	2,700
General overhead and miscellaneous supplies	10,000
Total per month	$57,200
Total per year	$686,400

*Courtesy of *Hardware World*.

Of the yearly total of $686,400, $225,600 goes for wages. In fact, ultimately a very large part of the entire expenditures of the mill goes for wages, since the iron mines, the oil companies, the power corporation and the transportation lines all have

employees and officers whose wages and salaries must be paid.

When foreign sheets come into any community at the rate of 1000 tons a month this productive income is lost. When the sheets are made at home this productive income goes into circulation.

At Present Prices Foreign Steel Can Blanket Our Entire Market

Has the foreign steel menace been overdrawn? The prices now being quoted on foreign steel speak for themselves. At those prices foreign mills can supply our entire market unless steps are taken to prevent it.

What can be done? The Hawley bill now being considered in Congress provides for the equalization of tariff duties by compensating for depreciation in foreign currencies. This would affect only our imports from Great Britain and Sweden. In 1931 these countries together shipped less than 8 per cent of our steel imports. Most of our imports have been coming from the Continent. Belgium alone accounted for 44 per cent of the total in 1931.

It is not to be thought, however, that imports from England and Sweden do not need watching. In March our imports of tin plate from the United Kingdom rose sharply to 2529 tons. This is indeed cause for concern, since our tin plate imports for the entire year 1931 amounted to only 196 tons. Welsh tin plate is now quoted at as low as $3.80 per base box at American ports as compared with the domestic price of $4.75, Pittsburgh. It will be noted that the Hawley bill, if enacted, would wipe out the disparity between the Welsh price and the American price. In addition, preference for superior American quality would be a factor.

Why Marking of Steel Is Important

The subject of quality suggests the subject of the marking of steel. All American steel products are marked and it is specifically provided for by statute that all manufactured products offered for sale in this country should be marked. However, the Treasury Department in one of its moments of generosity ruled that imported steel products did not have to be so marked, because they were materials and not articles and were used for remanufacture. Recently the department has reversed itself in the case of concrete reinforcing bars and there is therefore reason to believe that it will take similar action regarding other forms of finished steel.

Marking is important because it can still be said that American products are superior in finish and analysis to foreign competitive products. Without marking, the most insidious kind of competition is possible. Foreign material, alone, or mixed with American material is sold as domestic steel at prices domestic sellers can't meet. Again, foreign steel may be, and in fact has been, sold as domestic steel to governmental bodies which limit their purchases by law to American-made products. It is a first essential, therefore, that foreign steel sail under its own colors.

Relief Under Anti-Dumping Provision

As to obtaining protection from the ruinous prices quoted by Continental mills, as distinguished from British and Swedish producers, the American Iron and Steel Institute has already filed a complaint with the Bureau of Customs, Treasury Department, charging dumping of hoop, band and strip steel.

The difficulty with getting relief under the anti-dumping provision is that our machinery is so slow. The Treasury Department, through its agents abroad, must first ascertain whether dumping exists and this may take 30 to 90 days.

Foreign countries are by no means so deliberate in this regard. Exporters to Canada, for instance, are required to submit documents containing both the sales price and the prevailing home market price. If the Canadian customs appraisers are not satisfied that the domestic price given is authentic, they apply a dumping duty and collect it then and there.

The Flexible and Embargo Provisions of the Tariff Act

Another step that will be taken by the American Iron and Steel Institute will be to ask for higher duties under the flexible provisions of the tariff act. However, all that can be obtained through this channel is an increase of 50 per cent above present duties, which is obviously not enough, as existing rates would have to be doubled or trebled to offset prices now being quoted on foreign steel.

A final recourse for our iron and steel industry is to ask for the application of Section 337 of the tariff act covering "Unfair Practices in Import Trade." In subparagraph (e) of this section it is provided that foreign products may be embargoed by Presidential proclamation if unfair practices are shown following inquiry by the Tariff Commission.

Whatever action may be taken it should be taken promptly, for an emergency exists. It is true that steel imports to date have not been alarming in terms of tonnage. But the prices now being quoted on foreign material are a real menace. We cannot afford to let matters drift. When one discovers a small fire in his house he does not defer action until it has become a major conflagration.

The Heyday of Free Trade Is Over

And let us not be deluded by the free trade arguments of our economist friends. We cannot afford to sacrifice a domestic market that is a reality for a world market that we hope some time somehow to capture. The classic example of a nation that made a success of free trade is Great Britain, but Britain's success was due to unusual circumstances, and now even Britain has turned to protection. The truth of the matter is that Great Britain was the cradle of the industrial revolution and developed modern manufacturing first, for a considerable time being alone in the field. The exchange of manufactured products for raw materials worked out very satisfactorily until other nations took a leaf out of Britain's book. Now Germany, France, Belgium, Luxemburg, Czechoslovakia, Japan and the United States have become competitors of Britain as industrial nations. The heavy outpouring of manufactured products has stimulated raw material output the world over, for necessarily raw material countries must produce more to buy more. But right there is the rub. Consumption of raw materials is relatively inelastic. Beyond a certain point it is difficult to get people to eat more wheat or meat or to drink more coffee or tea. Until this problem of the inelasticity of raw material demand is solved, it is well to hold firmly to our domestic trade rather than to seek the pot of gold at the end of the foreign trade rainbow.

Pennsylvania Railroad May Obtain Loan

WASHINGTON, May 17.—Early resumption of electrification and terminal improvement work on the Pennsylvania Railroad between New York and Washington, requiring 60,000 tons of steel, is seen in the amended application of the railroad asking the Reconstruction Finance Corporation for a loan of $27,500,000. Originally, it had asked for a loan of $55,000,000, but at the request of the Finance Corporation the railroad has arranged to provide $27,500,000 by the sale of securities through banking and investment channels.

The amended application, filed last Thursday with the Finance Corporation and Interstate Commerce Commission, was submitted with the understanding that the Finance Corporation "will definitely commit itself at this time" to make the loan to the Pennsylvania Railroad on Oct. 1, 1932. It was stated that the Finance Corporation expressed a willingness to make the reduced loan if banking support were forthcoming "so as to avoid stopping or deferring such work." From this is assumed the loan from banking sources, plus $13,000,000 of the railroad's own funds will be used to resume the work at an early date.

Deliberate Action Needed to Avoid Further Economic Pitfalls

By DR. LIONEL D. EDIE

As the world enters the third summer of the depression, the economic policies of the leading nations remain about as undecided as ever.

Europe is still deriving some comfort from England's abandonment of gold. England's act temporarily broke the vicious circle of deflation in a limited group of countries. But the act was forced on England; it was not a deliberate policy, and, since last autumn, England's follow-up of her new financial position has been vacillating. She has imitated the most vicious part of protectionism. She has made a pretense at balancing her budget, but the balance is not genuine. She has taken no steps to develop a sane international monetary policy. She has not developed any solution of the brooding European crisis. She drifted into a collapse of the pound and, ever since, she has drifted with the world without plan or policy.

The most tangible effort at constructive leadership has been the Federal Reserve policy in the United States. In five weeks' time, $500,000,000 of "Governments" have been bought. This has lowered rediscounts $164,000,000, and has made the reserve base to that extent more liquid. But $471,000,000 of rediscounts remain, which means that member banks are still borrowing an amount equal to nearly one-quarter of their reserves.

The policy is working under great handicaps, but it is making progress. As one part of the whole problem, it is doing constructive work in its own sphere. It is helping to hold the tide, but it cannot do everything.

The Political Cloud

The tendency to blame Congress for all our ills is being overdone. Economic disintegration and financial inaction brought the country to a critical situation. Now that situation is being passed on a platter to Congress, and Congress is being damned for failure to clear up the mess promptly. Everybody else had failed to furnish a solution; now Congress is being blamed for failing. But Congress did not create this situation; Congress inherited it from the people who have hitherto believed in letting nature take its course and in deflating to the bitter end, whatever that might mean. Thinking is warped when leadership which has been unable to do anything about the depression turns to the politicians for leadership. The confusion of thought in Washington is no greater than the confusion elsewhere.

This is not, however, to soften in the least the demand for a balanced budget. The importance of removing the deficit cannot be exaggerated.

Nevertheless, it is well for the budget balancers to realize that they are moving toward a situation where the only way of realizing their goal may be a conversion of the national debt, Australian fashion. If and when the fiscal situation reaches that stage, will capital be willing to pay the piper?

The Attitude of Industrialists

The industrialist has not been as helpful as might be desired in this state of affairs. Certain industrial groups, while calling for a balanced budget, have brought pressure to bear to see to it that the taxes would fall on the other fellow. Was it the politician who defeated the sales tax, or the people who protested to the politicians?

Industrialists have not indicated their support of the Federal Reserve effort to hold the line in the great battle of finance. By waiting, they run the risk of losing the psychological opportunity for assertive cooperation.

Everybody knows that Central Europe is facing a crisis, and that war debts and reparations are at the core of the crisis. But the public opinion of this country is listless on the matter. Let Europe ride to its own fall seems to be the public attitude, and this attitude practically ties the hands of statesmanship. Everybody knows the crisis is coming; everybody knows how to combat it; nobody does anything about it.

The unemployment relief crisis is serious, and, during the last few days, a non-partisan plan has been evolved. This plan is two-fold—direct relief loans by the Reconstruction Finance Corporation, and public works loans.

The direct relief plan is the most economical. But we have worked up a notion in America that direct relief is a dole and a dole is terrible. Hence, we concoct all sorts of round-about public works schemes to take the taxpayer's money for State enterprises, which, after all, gives only a limited amount of relief.

What is needed is to make private capital markets function so that free enterprise can put people to work. We cannot do that by a further unbalancing of the budget and a further frightening of the bond market.

There is more capital in hiding today, in the United States and Europe, than at any time in a generation. The job is to draw that capital out and to get it to work voluntarily.

The best method of unemployment relief at present is the most economical method, and the most economical method is direct relief. To go beyond this method, and launch huge public works activities at this time, is a serious setback to factors of recovery.

Even direct relief should be financed by more economy in Federal expenditure rather than by more borrowing or more taxes. If we do not learn this lesson voluntarily, we shall perhaps have it taught to us by that hard task-master—one crisis after another.

The Gold Standard

It seems that the favorite topic of conversation in New York has become: Are we going off the gold standard? If so, how protect oneself from the consequences?

The main immediate inspiration of this anxiety is the inability of the Federal Government to set its financial house in order.

The more fundamental inspiration is the effect of the commodity price decline upon the burden of debt. The time has arrived for an international conference on the price level. Great Britain and the United States, and probably France, are challenged to unify their monetary policy, and other related policies, to the end of giving the debtor a decent chance to make good.

Hence, it lies within the power of human decision to preserve the gold standard. If we drop it, we fly to evils we know not of.

The pattern of this depression has been that nobody does anything about serious problems until they come right up to the brink of crisis. Then a few men go into a midnight huddle and bring forth an emergency device which everybody hails at the eleventh hour as a great act of statesmanship. It takes a crisis to produce action. What, then, are some of the seriously possible crises which stare the American people in the face in this third summer of depression?

1. A budget crisis.
2. A war debts and reparations crisis.
3. An unemployment relief crisis.
4. A closing of the Stock Exchange crisis.
5. A commodity price level crisis.
6. A gold standard crisis.
7. A social crisis.

These are preventable, but prevention requires deliberate action.

Gear Makers Discuss Industry's Problems

TECHNICAL, merchandising and management problems were discussed at the sixteenth annual meeting of the American Gear Manufacturers' Association, which was held at the Hotel Statler, Cleveland, May 12 and 13. An excellent program was carried out, and active discussion featured all sessions. Reports submitted during the meeting indicated that the technical standardization and other committees of the association had done considerable work during the past year.

E. W. Miller Elected President

E. W. Miller, chief engineer, Fellows Gear Shaper Co., Springfield, Vt., was elected president to succeed B. F. Waterman, engineer, Brown & Sharpe Mfg. Co., Providence. John Christensen, president Cincinnati Gear Co., was named first vice-president, A. A. Ross, engineer, General Electric Co., West Lynn, Mass., was elected second vice-president, and J. Harper Jackson, Pittsburgh Gear & Machine Co., was named treasurer. Messrs. Miller and Christensen had been first and second vice-president respectively.

J. C. McQuiston, Pittsburgh, was elected manager-secretary, succeeding T. W. Owen, who has been secretary of the association for the past ten years and who tendered his resignation. Mr. McQuiston until about a year ago was general advertising manager of the Westinghouse Electric & Mfg. Co., with which he was connected for some 30 years. He served for a time as president of the Association of National Advertisers and has been active in the A.G.M.A. for several years. The headquarters of the association will be moved shortly to the First National Bank Building, Wilkinsburg, Pa., a suburb of Pittsburgh.

Previous to the election of officers by the executive committee three members of that committee were elected by ballot. They are John Christensen, B. F. Waterman and H. H. Kerr, president, Boston Gear Works, Inc., North Quincy, Mass. Two vacancies on the executive committee due to recent resignations were filled by that committee by the election of George L. Markland, Jr., chairman of the board, Philadelphia Gear Works, and A. C. Gleason, vice-president, Gleason Works, Rochester, whose terms as members of this committee had just expired.

Amendments to the constitution and by-laws were adopted to allow those engaged in the teaching or study of gears in an institution of learning to take academic membership in the association without voting or administrative rights and with a nominal membership fee. The change provided for two general classes of members, the first to include those heretofore eligible and the second to include the teaching group.

The executive committee postponed decision on the holding of the usual fall meeting of the association.

A message of sympathy and of hope for his early recovery was sent to F. W. Sinram, president, Gears & Forgings, Inc., Cleveland, and honorary president and one of the founders of the association. A motion also was adopted regretting the resignation of Mr. Owen as secretary.

The design and use of worm gear hobs was the subject of a very interesting paper by L. R. Mayo, Brown & Sharpe Mfg. Co., which, in the absence of Mr. Mayo, was read by Mr. Waterman of that company. The writer referred to manufacturing complications that gear and hob makers have encountered from the use of multiple-thread worms and said that by applying certain fundamental principles to the design of both gear and hob at least a portion of the gear maker's troubles can be avoided. Various practices and standards that are used by the Brown & Sharpe Mfg. Co. were described. The paper was praised by A. A. Ross, chairman of the A.G.M.A. general standardization committee, as a comprehensive and complete presentation, and appreciation of the paper was formally expressed by vote of members.

Much interest was shown in an address by Harold S. Falk, Falk Corpn., Milwaukee, on apprenticeship and its relation to the national metal trades industry. It is difficult, he said, to get a new angle on the subject of training in industries. However, this training might be likened to national defense and be called industrial defense. The spread of radical teachings in the shop by communists can be prevented by the training of apprentices, he declared. A boy goes from public school to the shop as an apprentice and is free from the regulations that have controlled his activities while in school. If a personal interest is taken in his development he becomes convinced that his employer is interested in his welfare as well as in his work. A feeling of loyalty is aroused in a boy and he becomes impervious to communistic propaganda. The speaker showed lantern slides of some of the activities of the boys in his company's vocational school.

In a talk on the gear industry in North Carolina, Richard Ferguson, Ferguson Gear Works, Gastonia, N. C., spoke of the industrial development of that State with large tobacco factories, cotton mills and other plants that have created a demand for forgings and gears.

Argues Against Non-Ethical Practices

Benefits that accrue to members from having reports showing the volume of gear business were stressed by E. S. Sawtelle, Tool Steel Gear & Pinion Co., Cincinnati, in his report as chairman of the association's commercial standards committee. It is a great satisfaction to a gear manufacturer, he said, to be able to compare his bookings with a composite that represents the industry as a whole. The report was followed by an address by Mr. Sawtelle on business ethics affecting gears. He urged the industry to give serious study to a reasonable standard of ethics so that volume-mindedness will not lead to ridiculous extremes in trade practices and to loss of confidence in the integrity of fellow members. Non-ethical practices, he pointed out, ridiculous price slashing and unfair competition do not appreciably increase the total volume of purchases.

Low pressure selling was the subject of an address by J. Harper Jackson, Pittsburgh Gear & Machine Co. Reviewing the development of the gear making industry both in efficient equipment and geographically, he said that there had been a gradual leveling down in the industry until it has become far more difficult for one maker to stand out above his competitors in the quality of its product and his capacity to serve his customers. A maker should not resort to high pressure to get a large volume of business but should be satisfied with a smaller volume at more satisfactory prices. The speaker displayed several charts to show that an increase in output results in only a slight decrease in production costs. A maker must have a very large increase in volume, he said, to overcome a considerable re-

duction in selling prices. It is a fallacy for the gear industry to think that a cut in price is going to result in an increase in profits, he contended.

Following a progress report of the uniform cost accounting committee, H. N. Mathias, Westinghouse Electric & Mfg. Co., chairman of the committee, made an address on overhead control as part of standard costs. In connection with this subject he suggested that superintendents and other supervisors of plant operations be given as a bonus part of the savings in plant operations, using the budget as a basis for computing the savings. He thought the bonus should be about 30 per cent of the savings in the budget.

New light on the strength of gear teeth was the subject of a paper by A. B. Cox, Coraopolis, Pa. He favored the use of gears with longer teeth than now generally used and so designed that two pair of teeth are in contact in a set instead of approximately 1½ pair of teeth as in ordinary gearing.

E. W. MILLER

J. C. McQUISTON

B. F. WATERMAN

Progress Made in Technical Standards

DISCUSSIONS of technical standards were presided over by A. A. Ross, chairman of the association's general standardization committee.

H. J. Eberhardt, secretary, Newark Gear Cutting Machine Co. and chairman of the sub-committee on tooth form, reported that during the past six months effort has been made to bring final completion and adoption of the proposed American Standard for tooth form for 14½ and 20-deg. full-depth involute systems. A letter ballot on two tables which were in question is now in progress and when this is completed the standard will be submitted to the sponsor organizations and to the American Standards Association for final approval. When published it is the intention to combine it with the American Tentative Standard, spur gear tooth form 14½-deg. composite system and 20-deg. involute tooth system. Later in the meeting a progress report of the tooth form committee was submitted in a letter from Mr. Eberhardt. The sub-committee on materials reported that changes were being made in the original draft and that the revised proposals would be sent to the sub-committees shortly.

Tests Made on Non-Metallic Gears

Tests on non-metallic gears have been conducted, according to the report of the A.G.M.A. research committee submitted by Prof. Earle Buckingham, Massachusetts Institute of Technology, who reported for E. W. Miller, chairman of that committee. These tests, not yet published, checked closely with the original tests, he said. Professor Buckingham also stated that the committee has been making some interesting surface fatigue tests of material in non-metallic gears. He listed five types of wear in these gears. These are pitting, abrasion due largely to abrasive material in the oil, scoring or cutting when there are geometric errors in the form, scuffing where lubrication fails and the surface wears away and seizing where lubrication fails and the bearing heats up. These tests are being continued on various samples. The committee has developed testing apparatus to determine surface fatigue. Tests of helical gears have been started.

The more important work of the bevel and spiral bevel gear committee is completed, according to A. A. Ross, who in the absence of the chairman, F. E. McMullen, Gleason Works, presented the committee's report. The work of the inspection committee, headed by F. W. England, vice-president, Illinois Tool Works, Chicago, was said to be about finished.

With a view of having standard proposal forms for various types of gears the library committee, through its chairman, M. T. Schumb, Boston Gear Works, reported that it had gathered together proposal forms used by many manufacturers and also had secured suggestions for uniform forms. It had used this information to prepare a composite form, copies of which were distributed. Mr. Ross pointed out that the committee had done a good job. The forms, he said, are only proposed forms which the members may use on their own letterheads. Later it is the intention to supply purchasing agents with the information contained in the forms.

The nomenclature committee through its chairman, D. T. Hamilton, engineer, Fellows Gear Shaper Co., reported plans to publish its nomenclature for different types of gears in dictionary form. The keyway and tooth form committees are carrying on their work, which, said Mr. Ross, will require a long time to complete.

Proposed recommended practices for computing the allowable tooth loads of metal spur gears were submitted by the spur gear committee through its chairman, Prof. Earle Buckingham, who said the proposed practice was a radical departure from the old practice. This included a number of tables and charts. The load carrying ability of a pair of spur gears may be limited by either the beam strength of the gear tooth or the surface fatigue limit of the material and the lowest of these two values should be used to establish the load carrying ability of any given pair, the report stated.

In his brief review of the report Prof. Buckingham pointed out that results of tests indicate two possible causes of failure in spur gears, the breaking of teeth and excessive wear of teeth, there being no definite relation betwen the two. The proposed practice is for setting up means of determining the dynamic load while running. However, to determine the intensity of the dynamic load there must be a way of determining the error of gears while in action. The committee proposed to set up three classifications for gears: (1) good commercial gears; (2) gears having accuracy attained by special care, and (3) the highest type of gears that can be produced with general commercial practice. Noise of operation, the report stated, is usually a very good test of the accuracy of gears. One of the charts gave some measure of the order of accuracy required at different velocities and may be used as a guide for the selection of the proper class of gear to meet specified speed conditions.

The report was adopted as a proposed recommended practice and members were requested to give the plan a trial and submit criticism.

The worm gear committee plans to prepare standards for all worm gearing and will enlarge its program to include worms, said T. R. Rideout, Westinghouse Electric & Mfg. Co., in reporting for the committee.

G. H. Charls Calls "Dumping" a Menace to Economic Recovery

President of National Association of Flat Rolled Steel Manufacturers Visualizes Imports in Terms of Labor Lost

MORE than 237,000 American steel workers lost a full week's work in 1931 because of foreign steel sold here, according to a calculation made by George H. Charls, president, National Association of Flat Rolled Steel Manufacturers, and presented by him in an address to the National Association of Sheet Metal Distributers at its convention in Philadelphia on May 11. Mr. Charls' subject was "How the Distributers Can Most Effectively Cooperate with the Mills." He presented three suggestions as offering a fertile field for cooperation between mills and distributers at this time: A vigorous anti-dumping campaign, more aggressive sales effort, and a sound plan of distribution.

Visualizing the "appalling economic loss" to American workers caused by imports of steel from Europe, Mr. Charls cited the following facts:

Imports of all classes of steel products in 1931 were 369,923 net tons, of which flat rolled products were about 45,000 net tons.

Through the imports of flat rolled steel alone 28,846 men lost a week's work, while 237,130 men lost a week's work through the imports of the total of 369,923 tons of steel imported.

Railroads lost the equivalent of 55,080 freight cars' service and revenue, and their employees a proportionate loss.

The mining and shipping interests on the Lakes and their employees lost the production and transportation of 1,035,986 net tons of ore.

Coal operators and their employees lost the mining and sales equivalent to 898,966 net tons, causing 36,994 miners to lose a week's work.

Manufacturers of refractory brick and their employees lost the production and sale of 4,439,340 brick.

Producers of limestone and their employees lost the production and sale of 184,972 tons of limestone.

Dumping of Foreign Steel "Menace to Economic Recovery"

"The outstanding need for immediate cooperation between the jobbers and the mills seems to be centralized in the dumping of foreign steel," said Mr. Charls. "This serious menace to economic recovery is due to the inadequacy of our tariff to cope with the depreciated currencies of Europe and the competitive price levels such depreciations have created." Mr. Charls said that the figures he gave demonstrate that "it is not wise to minimize the inroads such importations of steel make upon American earnings and purchasing power."

"There is one way to partly correct this situation," he added, "and that is write your representatives in Congress, as well as the members of the Ways and Means Committee of the House, urging them to bring before the House for serious consideration the Hawley bill, H. R. 8688." This bill is designed to rectify the tariff so that it will give adequate protection by a readjustment of duties to provide for the depreciated currencies of Europe and their effect upon commodity prices.

Mr. Charls called attention to the fact that the State purchasing agent and the State Highway Commission of Maryland, following a similar decision in New Jersey, have ruled that foreign steel will not be acceptable on their work in the future, also that no foreign reinforcing bars are to be used on Federal work and that the Public Improvement Commission of Baltimore has specified domestic steel on contracts under its jurisdiction. Mr. Charls said that, as a body, the National Association of Sheet Metal Distributers should be able to exercise a very general influence in all States to discourage the use of foreign steel on Federal, State and municipal work.

Jobbers in seaboard cities, he said, "will face the dilemma of either handling such foreign products or suffering some loss of business. Whether or not these jobbers and consumers will see that their own interest will be best served by refusing to handle foreign products remains to be proved."

In answer to the question, can or should American manufacturers meet the prices being named by this foreign competition, Mr. Charls said: "Can anyone conceive the conditions that would apply in this country if labor was forced to work for 10c. per hr. or $1 a day, as in 1898? It is unthinkable, but that is just what foreign dumping threatens."

Consumer Needs Education in Use of Sheet Steel Products

Aside from the matter of foreign steel, Mr. Charls emphasized the need of cooperation between jobbers and mills in the inauguration of a more aggressive sales campaign to increase the business of both. He said that most of the mills leave the dealer and the retailer entirely to the distributer. "Who shall inspire, guide and direct the sheet steel and roofing dealer and retailer in a sales drive to create consumer demand?" he asked.

"The newspapers are teeming with enticing advertisements, the air is saturated with sales appeal, and the nights are lighted with attractive signs of the distributers of almost every other product except steel and the products made therefrom.

"How is the consumer to know of the bargain prices prevailing on his requirements demanding sheet steel? Allowing for advance in freight rates, black and galvanized sheets are $5 to $9 a ton lower than 1913 prices.

"How can we ever hope to win our proper share of the consumer's dollar by figuratively folding our hands and complacently waiting for such part of it as other industries have overlooked?

"The suction sweeper, the brush, the refrigerator, the lightning rod, the farm lighting salesmen are registering 10 calls a day with a thoroughly prepared stop-watch argument, but who ever thinks of soliciting a market of six million farms with an annual purchasing power of twelve billion dollars in 1929, to sell the safest, most economical roofing and the best for the money a farmer can buy.

"How many have joined the home renovating movement or urged their dealers to do so? How many have attempted to create consumer demand for the sheets they sell dealers? Aren't we all of us overlooking our opportunity to create sales?

"There are 36,000 hardware dealers, 13,000 implement dealers, 143,000 general stores, 25,000 lumber yards, 35,000 sheet metal and roofing contractors, or a total of 252,000 possible agents to be galvanized into action. Can this enormous army be aroused and made a dynamic merchandising force to create a greater volume for sheet steel and roofing sales?

"I am firmly convinced that if we go to work in earnest, give the name 'distributer' a new meaning and have him inaugurate a vigorous campaign to induce his dealer to go out and initiate sales and get a larger share of the consumer's dollar, we will be distributing one and a half million tons annually instead of seven hundred and fifty thousand tons, the maximum that has ever moved through jobbing channels.

"The third and equally important problem to be worked out by the mills and the jobbers is a plan of distribution in which all can concur.

"It would seem that before any satisfactory cooperation between the mills and jobbers can be obtained on a plan, the jobbers and the mills should coordinate their widely divergent ideas as to what constitutes the function of a jobber and his proper sphere of activities in the distribution of sheets and roofing, as distinguished from the dealer and retailer."

Steel and Allied Industries Appear in Support of the Hawley Bill

By L. W. MOFFETT

WASHINGTON, May 17.—Led by the iron and steel industry, a vigorous move to offset the effects of depreciated foreign currencies on American industry and labor was actively begun last Thursday before the House Committee on Ways and Means at hearings on the bill of Representative Hawley, Republican, of Oregon. The bill, passage of which was strongly urged, seeks to equalize tariff duties by compensating for the debasement of currencies abroad. The hearings are scheduled to come to a close tomorrow. A number of interests, including importers of Swedish steel bars, opposed the measure.

The hearings were opened by Thomas J. Doherty, New York, tariff counsel of the American Iron and Steel Institute. He pointed out that depreciated currency has made it possible for Great Britain and Sweden to ship steel into the United States at low landed prices which the domestic industry cannot possibly meet, with the result that both the industry and its labor are suffering greatly. Similar conditions were recited by individual spokesmen representing the crushed steel, ferromanganese, titanium and ilmenite and wire cloth industries. Some of them said that unless the situation was remedied quickly their industries would disappear. Other industries supporting the bill included linen, wool, paper, lace, pottery, mining and chemical.

Congress Action on Bill Is Difficult to Forecast

It is difficult to indicate what action may be taken on the bill. While the Ways and Means Committee, as is the House, is controlled by Democrats, only one of the latter, Representative Rainey, majority leader, of Illinois, appeared to be particularly critical of the bill. On the other hand, they did not indicate their sympathy with it as did the Republican members of the committee, which was presided over by Acting Chairman Crisp, Democrat, of Georgia, in the absence of Representative Collier, of Mississippi, who is ill.

Even if the measure were reported out favorably by the committee, it would have to pass the House, go to the Senate Committee on Finance and

if reported out favorably by that committee, pass the Senate and then to conference, provided it carried any revisions. Favorable report by the Senate committee and passage by the Senate would seem probable since both are Republican controlled. Yet the majority is so slim it is easily broken down by an "insurgent" move. What the attitude of President Hoover would be if the bill went to him for action is not known. Since Congress is to adjourn June 10, action on the bill will have to move with comparative rapidity if it is to be passed.

Secretary Mills Declines to Commit Himself on Bill

Its supporters were somewhat disappointed with the Treasury attitude toward the bill as expressed by Secretary Ogden L. Mills. He submitted an opinion on the bill to the Ways and Means Committee at the request of Mr. Crisp. Mr. Mills is a former member of the committee.

He refused to commit the Treasury Department, and spoke of administrative difficulties of the proposed legislation.

"As to the desirability of enacting this measure into law," Secretary Mills said, "the Treasury considers that this is a question of tariff policy upon which, in line with long established precedent, it should not comment." Other features of his opinion were lacking in encouragement.

It was pointed out that the bill provides an additional duty on articles imported from any country whose currency is 5 per cent or more below the standard value of such currency proclaimed by the Secretary of the Treasury on Oct. 1, 1931. The additional duty would apply to articles dutiable under existing law and to exempt articles if the latter are of the class or kind mined, produced or manufactured in the United States and would be equal the difference between the value of the imported articles at the standard value of the unit foreign currency on Oct. 1, 1931 and the value at the buying rate as of the date of exportation.

It is further provided, Secretary Mills explained, that in an assessment and collection of duties under existing law the value of articles shall be determined at the standard value of the monetary unit of the country of origin on Oct. 1, 1931. The act would be in effect until Dec. 31, 1933.

Free Trade Virtually in Effect with Some Countries

Importations of steel are large and in respect to depreciated currency countries, free trade is in effect, Mr. Doherty told the committee. Low landed prices consequent upon the depreciated currencies abroad, he declared, have spread to the steel industry with great force, of the countries which have abandoned the gold standard since the present tariff law was passed, two — England and Sweden—are large producers of iron and steel. Pointing out that the results are manifested in heavily increased imports from those countries, Mr. Doherty said that they are exporting to the United States steel products which hitherto they had not shipped to this country. The extreme cheapness of the goods in American money was said to make the landed cost at the American port so low that the domestic steel has not a chance.

Combatting a general assertion, Mr. Doherty declared that duties on steel in the American tariff are low under any and all conditions. Unlike other countries, he explained that the United States cannot by administrative fiat deal with such a situation as has developed but must do so by legislation.

"It is intolerable that our law should be nullified, that our Government shall be deprived of its lawful revenue, that our citizens shall be thrown out of their jobs, not as a result of anything we did or omitted to do ourselves, but because of the exigencies, economic or political, of a foreign jurisdiction," Mr. Doherty said.

Not only have steel importations

from England and Sweden increased greatly in quantity since the fall in currency, Mr. Doherty said, but also the unit value in American money has decreased in most instances.

Large Increase in Imports from Sweden and England

"As between December, 1930, and December, 1931, in one item from Sweden, flat wire and steel in strips, there was an increase in quantity of 264.5 per cent and a decrease in cost of about 33 1/3 per cent," Mr. Doherty stated. Unfortunately, too, the imports from Sweden comprise a substantial percentage of fine steel so-called, including alloy steel, drill steel, tool steel, etc., the production of which entails a high order of skill in workmanship and a relatively hign labor cost. Finally, the idle workmen from the steel mills of the land, some as far in the interior as Kansas City, see pass by carloads of foreign steel and wire products that have driven out the domestic products, the making of which formerly provided those men with jobs. Certainly the disaster to our country caused by the currency depreciation can be remedied, for all that is sought is a restoration of the situation as it was when Congress legislated in June, 1930.

"The Government cannot and should not be at the loss of its revenue and the ranks of unemployed not be augmented because some foreign governments have seen fit to alter their financial set-up."

In his statement which opened the hearings, Mr. Doherty explained that at 20 per cent the duty on English goods invoiced at £1000 on Aug. 1, 1931, with the pound sterling at par, $4.8665, would have been $973.31, while on Dec. 8, 1931, when the pound depreciated to $3.255, the duty would have been only $651. In effect, he stated, this reduced the duty, fixed at 20 per cent, to a fraction over 13 per cent. Based on the importations of 1931, he said, it has been estimated that the Government's loss in revenue for a year under depreciated currency will be $140,000,000.

"Need I expatiate on the folly of throwing that huge sum of money away, especially at a time when it is sorely needed and when you are resorting to every possible form and source of revenue?" Mr. Doherty asked.

He said also that one year ago importations from countries with depreciated currencies were 38 per cent of the total but that they are now 52 per cent. At the same time, Mr. Doherty said, there has been an actual decrease, in the majority of instances, of the unit value as expressed in American money. This was pointed to as proof that there has not been an increase in foreign prices to atone for the drop in currency.

"The unemployment of our workmen has been perceptibly increased by the influx of the abnormally cheapened foreign goods," Mr. Doherty said. "On the workers has fallen the burden and shock of this unfair and unlooked-for foreign competition."

Representative Hadley, Republican, of Washington, asked Mr. Doherty if he attributed the increased percentage of total importations from depreciated currency countries solely to depreciated currency.

"Absolutely," replied Mr. Doherty.

"Many do not understand the fiat decrees of other countries for administrative remedy," said Mr. Hadley. "Why do people in the United States have to go to Congress for a remedy?"

"All I can say is that Congress has not clothed administrative authority with similar power," Mr. Doherty said.

"Is it not also due to constitutional limitation?" Mr. Hadley asked.

Mr. Doherty said that he believed that the constitution does give Congress the power to give such administrative authority.

Representative Rainey, Democrat, of Illinois, who apparently opposes the Hawley bill, asked Mr. Doherty if it would not raise the tariff.

"It would not; it would equalize the tariff," said Mr. Doherty.

Representative Hill, Democrat, of Washington, asked Mr. Doherty how he accounted for imports from countries which are not off the gold standard.

Mr. Doherty said he had heard that England, a country with depreciated currency, may yet be underselling Germany, which is on the gold standard.

"Isn't this a measure to maintain the tariff, due to depreciated currency?" inquired Representative Hadley.

"It is," Mr. Doherty responded.

Abrasives Industry Supports Bill

Support of the bill by the abrasives industry was given by G. H. Kann, president, Pittsburgh Crushed Steel Co., who said that the duty protection of ¾c. per pound on grit, shot and sand of iron or steel, had been decreased by approximately 91 per cent on account of depreciated currency in Great Britain, the chief source of importations, Mr. Kann submitted figures showing that imports ranged from 87,000 lb. in 1927 to a peak of 3,041,311 lb. in 1930, while in 1931 they were 2,443,942 lb. The average selling price of grit and shot imported is £10 per net ton, he pointed out. Converted into American money on the gold standard of $4.86 per pound sterling this selling price amounts to $48.60, while it was only $35 when based on the average current rate of exchange of approximately $3.50 per pound sterling. It was pointed out that therefore the decrease in the selling price is $13.60. With the duty amounting to $15 per net ton less the decrease in the selling price, the present duty protection was given as $1.40.

Mr. Kann also spoke on behalf of the Steel Shot & Grit Co., Amesbury, Mass.; the American Steel Abrasives Co., Galion, Ohio; the Globe Steel Abrasive Co., Mansfield, Ohio, and the Steelblast Abrasives Co., Cleveland.

The testimony of Charles Rees, New York, vice-president of the Vanadium Corpn. of America, dealt with competition of foreign ilmenite and titanium ore and its effect on the American industry.

He stated that the Southern Minerals Products Corpn., a subsidiary of the Vanadium Corpn., has established a titanium ore industry in Amherst County, Virginia, and that it is confronted with unfair competition in marketing it through the depreciation of Indian currency.

"If no redress is afforded, the company will be obliged to discontinue its operations," said Mr. Rees. "This is a new industrial development in Virginia and promises to be of real importance to commerce and labor in the State."

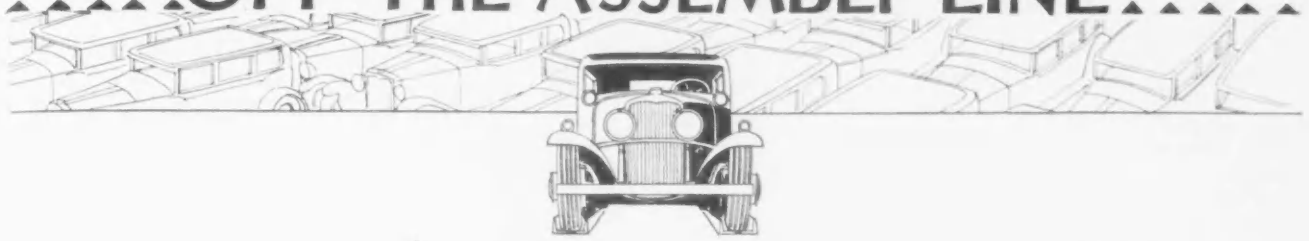
Ferromanganese Trade Also Seriously Affected

Since Great Britain went off the gold standard the price of ferromanganese has declined from $80 to $72 per ton, Atlantic seaboard, the committee was told by N. R. McLure, Philadelphia, of the E. J. Lavino Co. He said that his company, which had established the ferromanganese industry in the United States, finds that the price is not sufficient, with the result that its three blast furnaces, one in Virginia and two in Pennsylvania, are all idle. Unless some such a measure as the Hawley bill is enacted, Mr. McLure said, there will be no ferromanganese industry in the United States. He said foreign ferromanganese is underselling domestic material by $7 to $9 per ton. He attributed this situation partially to the fact that Russian manganese ore sold in Europe is paid for in depreciated sterling while that imported into the United States is paid for in American dollars.

Representative Eslick, Democrat, Tennessee, inquired as to whether foreign ore is bought to the exclusion of domestic ore. Mr. McLure said his company uses domestic ore and said that if it can be done on a sound economic basis he is in favor of stopping all dumping from Russia.

H. L. Derby, New York, chairman of the tariff committee of the National Association of Manufacturers, strongly urged a "Buy American" movement. Great flaming placards urging the purchase of British goods were shown by Representative Bacharach, New Jersey, who said the "Buy British" campaign was hurting American products and should be met by a like campaign in this country.

OFF THE ASSEMBLY LINE



Ford's Production Steadily Expanding; Chevrolet and Plymouth Busy

DETROIT, May 16.

THE Ford Motor Co. has placed strip steel for frame requirements, a small quantity of sheets and several other steel items in the past few days. These orders, estimated at 8000 tons, are in the nature of a fill-in and are for prompt delivery. In addition to these purchases, which were divided among several mills, Ford is expected to make its regular steel buy for June about May 25.

Satisfactory progress is being made in expanding production at the Rouge plant, and the daily output is averaging 2000 cars, divided about equally between fours and eights. It is reported that one day the past week 2400 units were turned out. Ford's immediate objective is to raise production to 3000 cars a day by June 1, as many of the cars as possible to be eights. The ability to secure cylinder blocks is the limiting factor in the manufacture of the V-eight.

It now looks as though Ford's total this month will be about 40,000 cars and in June, 60,000 to 65,000. July is the earliest month in which the 100,000 unit mark is likely to be attained. In other words, in the 90-day period from May 1 to July 31 Ford hopes to make a minimum of 200,000 cars, with a possibility that the final figure may be boosted to 250,000.

Since body makers and parts manufacturers in most cases have supplied stocks considerably in excess of the number of motors available, current activities on the part of outside suppliers is lagging behind Ford's own operations at Rouge. The active demand for steel by the Ford company makes the Detroit district, including the Great Lakes and Ford steel plants the busiest steel producing center in the country.

Because of the many uncertain factors prevailing today which make forecasting particularly hazardous, it is virtually impossible to foresee when the seasonal production peak for automobiles will be attained. Some think it is here now; on the other hand, Ford promises to step up its output more than enough next month to offset any possible decline in either Plymouth or Chevrolet, or both, so it seems as certain as anything can be today that June will surpass May. Beyond June, however, it looks as though the tapering off by the entire industry aside from Ford may be greater than Ford gains, leaving June as the top month for the year. However, Ford's activity alone will assure a good summer performance compared with March, April and May. In fact, unless the medium-price and quality makers are able to snap out of their lethargy, by midsummer Ford may be manufacturing 50 per cent or more of the industry's total. Of course, the appearance of two newcomers as Ford's competitors may make some change in these calculations.

Ford unexpectedly has placed orders for sheets and strip steel.

* * *

Chevrolet sold 61,309 cars to consumers in April, or upward of 5000 cars more than it made.

* * *

Ford production is about 1600 cars daily, of which 1000 are eights.

Ford Production Expanding

Despite the depression, Ford's production is steadily expanding and the Rouge plant today is perhaps the busiest industrial spot in the United States. Employment there is at about 85,000. Ford is said to be building half of its frames now and Murray the other half at its Ecorse plant. Several makers of malleable castings have received fairly good releases from Ford.

In April Chevrolet sold 61,309 cars to consumers, compared with 33,125 cars in March, a gain of 85 per cent. This was upward of 5000 cars more than it produced last month. It is interesting to note that retail sales progressed during the month, being divided as follows: First 10-day period, 17,461 cars; second period, 19,672 cars; third period, 24,176 cars. By far the best record was in the final 10-day period, after the influence of the General Motors exhibits had largely worn off. General Motors' sales to consumers in April showed a total of 81,573 cars. This meant that Chevrolet sold 75 per cent of all cars in the General Motors organization last month. One feature of G. M. activities in April which has passed unnoticed is that sales exceeded production by 12,544 cars, showing that there is no disposition on the part of factories to build up dealers' stocks. Chevrolet should make about 55,000 cars in May and is specifying steel at a fair rate.

Plymouth, still adhering to a schedule of 25,000 cars this month, is likewise taking steel in moderate volume. Plymouth bodies have been turned out in quantities of 1000 a day by Briggs; the overflow above that amount has been taken care of by the Chrysler body plant on Kercheval Avenue, Detroit. Incidentally, this body plant is one of the busiest units in the automobile industry, as it makes practically all Chrysler and DeSoto bodies, a good share of the Dodge requirements and the extra needs for Plymouth. This is one place where Chrysler has become more self-contained, as outside body builders used to make a considerably larger share of bodies than they do today.

Quality Car Makers Suffering

Production in the quality field remains almost at a standstill. The dullness in this group during what is normally one of the big months of the year is due to several factors—over-

production in the first quarter, reduced buying power of consumers and the sale at low prices of new 1931 cars, stocks of which factories desired to liquidate as quickly as possible. In the middle-price class output has been declining for several weeks and this downward movement is not likely to be arrested. One thing seems assured — producers, especially in the light car field, will shortly eliminate some of the models now on the market, thereby reducing investments required by dealers to carry adequate stocks and cutting down manufacturing costs by standardizing on a fewer number of models. Final action on this matter will probably be taken at the next meeting of the board of directors of the National Automobile Chamber of Commerce. Another question now being discussed, but on which opinion is divided, is the feasibility of advertising delivered retail prices rather than continuing the present system of "f.o.b. Detroit." This may be tried out in a localized district, such as Detroit, to see how it works.

General Motors is moving its Muncie Products division from Muncie, Ind., to the southern Michigan district. Announcement has been made that this division will occupy part of the Oldsmobile plant at Lansing. It is believed that the next division to be transferred to the Detroit area is Brown, Lipe & Chapin, now at Syracuse, N. Y. All of these consolidations, of course, are primarily in the interests of economical production.

British Iron and Steel Output Lower in April

LONDON, ENGLAND, May 14. (*By Cable*).—Production of pig iron and steel ingots declined in April in the United Kingdom. The total for pig iron was 316,900 tons against 335,600 in March, while steel ingots totaled 433,300 tons in April, compared with 462,800 tons in March. Monthly totals for all of 1931 and the four months of this year follow:

	Pig Iron	Steel Ingots
1931		
Jan.	337,200	402,200
Feb.	318,200	486,400
March	357,100	500,100
April	323,200	397,400
May	346,500	435,100
June	323,800	428,900
July	317,000	428,700
Aug.	275,700	375,300
Sept.	248,200	400,500
Oct.	284,200	457,400
Nov.	296,400	459,200
Dec.	330,600	422,400
	3,758,100	5,193,600
1932		
Jan.	332,400	429,700
Feb.	318,100	480,600
March	335,600	462,800
April	316,900	433,300

Members of the Electric Hoist Manufacturers Association report that the number of hoists ordered during April decreased 20 per cent as compared with the previous month, and the value of such orders decreased 35 per cent.

... PERSONALS ...

JOHN W. SEENS

F. J. LANAHAN

JOHN WILLIAM SEENS, who on July 1 will become president of the Canadian Steel Corpn., Ltd., Ojibway, Ont., is an American by birth but is of Canadian ancestry on his paternal side and in 1920 became a Canadian citizen by naturalization. He was born in Cincinnati Nov. 8, 1881, the son of William Seens, of Ontario, and Sadie (Lester) Seens, of Indiana. He was educated at the Grand Rapids, Mich., high school and at the University of Michigan, from which he was graduated in 1904 with the degree of bachelor of science. His entire business career has been in the Dominion. In June, 1904, he entered the service of the Canadian Bridge Co., Ltd., Walkerville, Ont., and continued with that organization in various capacities until 1911, when he was appointed manager of the Structural Steel Co., Ltd., Montreal. Mr. Seens returned to the Canadian Bridge Co. as sales manager at Montreal in 1918. He was elected a director of the company in 1922, vice-president in 1926, and president in 1927. In assuming the presidency of the Canadian Steel Corpn., Ltd., on July 1, Mr. Seens will continue as president and general manager of the Canadian Bridge Co. and president of the Essex Terminal Railway Co., Walkerville, all three of these companies being subsidiaries of the United States Steel Corpn. Mr. Seens is a member of the Engineering Institute of Canada and of the American Iron and Steel Institute.

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FRANK J. LANAHAN, president, Fort Pitt Malleable Iron Co., Pittsburgh, was elected vice-president of the American Foundrymen's Association at its annual convention in Detroit, May 3 to 5. He has been one of the board of directors for the last three years and active in the work of the association for a long period. Mr. Lanahan is also president of the Davis Brake Beam Co., Johnstown, Pa.; president of Fort Pitt Mine Equipment Co., Jeannette, Pa.; president McKees Rocks Trust Co.; chairman of the board, Auto Tite Joints Co., Pittsburgh; vice-president, Chartiers Trust Co., McKees Rocks, Pa.; vice-president, Pennsylvania State Chamber of Commerce and a trustee or director of many other educational, civic and industrial organizations.

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EARL H. SEELBACH has been appointed district engineer, with office at 381 Ellicott Square, Buffalo, for the Despatch Oven Co., Minneapolis, Minn.

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H. A. MARTI, who has been associated with the Maumee Malleable Castings Co., Toledo, since its organization, has been made general manager, succeeding LaMotte P. Henry, who has resigned.

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DR. MILTON C. WHITAKER, recently elected vice-president of the American Cyanamid Co., New York, has been made a member of the board of directors.

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HARRY L. HORNING, president, Waukesha Motors Co., Waukesha, Wis., manufacturer of gasoline engines, has sailed for Europe. He expects to be absent two months, visiting England, France, Germany, Sweden and Italy. The principal object of his visit is to arrange for the manufacture of Waukesha engines in England and France under license to local shops by way of surmounting tariff barriers.

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JAMES M. DILL, for the past 12 years manager of steel castings sales of the Erie Forge Co., Erie, Pa., has resigned to become manager of sales of the Erie Bolt & Nut Co., Erie. He succeeds HARRY O. MCCULLY, who is

to become general sales manager of the Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y. Mr. Dill is a member of the class of 1913, University of Illinois, and before joining the Erie Forge Co. was connected with the Electric Steel Co., Chicago, as sales manager. Mr. McCully became identified with the Erie Bolt & Nut Co. following his discharge from the army after the World War and since 1930 had been president of the company. Prior to the war he was with the Atlantic Refining Co. He was graduated from the University of Michigan in 1913.

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ROBERT KLAAS, formerly identified with Hammond Machinery Builders, Inc., Kalamazoo, Mich., has been added to the machinery division staff of Divine Brothers Co., Utica, N. Y. He has been connected in various capacities with the polishing industry all his life.

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E. F. GOHL, formerly manager of the Los Angeles district office of the McClintic-Marshall Corpn., has been appointed Pacific Coast manager, with offices at Twentieth and Illinois Streets, San Francisco. Mr. Gohl was graduated from Lehigh University in 1907 and has been with the McClintic-Marshall Corpn. since that time.

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WILLIAM M. MCFATE has been appointed assistant manager of sales of the tin plate division of the Wheeling Steel Corpn., Wheeling, W. Va. He has been with the Wheeling company for several years and had previously been connected with the Detroit Steel Corpn., Weirton Steel Co. and the former Trumbull Steel Co., his experience with the tin plate industry having started with the latter company in 1913.

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JOHN G. WOOD, general manager of the Muncie Products Co. division of General Motors, has been appointed chief engineer of the Olds Motor Works, Lansing, Mich., succeeding C. L. MCCUEN, who has become technical assistant to I. J. REUTER, general manager of the Oldsmobile and Buick divisions of General Motors.

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JUAN DE LA CIERVA, has been awarded the Daniel Guggenheim gold medal of 1932 for development of the theory and practice of the autogyro, which flying machine is built by the Pitcairn-Cierva Autogyro Co., Philadelphia, and the Cierva Autogyro Co., London, England. The board of award is made up of 15 members, four of whom are appointed by the American Society of Mechanical Engineers, and four by the Society of Automotive Engineers. The other members represent foreign countries.

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JAMES D. HENRY has been elected treasurer of the Ferro Enamel Corpn., Cleveland. He has been with the company for many years.

... OBITUARY ...

F. F. LANDIS

F. F. LANDIS, whose death on May 2 was noted in these columns last week, made his first commercial grinding machine in 1872 at Lancaster, Pa. This machine did both external and internal grinding, and it was not until 1889 that Mr. Landis attempted to commercialize it. He formed a partnership with his brother, A. B. Landis, under the name of Landis Brothers, later the Landis Tool Co., Waynesboro, Pa., to develop a commercial cylindrical grinding machine. While identified with the Geiser Mfg. Co., maker of agricultural machinery and implements, he assisted his brother in the development of a bolt cutter employing a tangential threading die. This brought about the organization of the Landis Machine Co. Mr. Landis held many patents on a variety of products, including automobile shock absorbers, feed-water regulators and concrete block machinery.

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JAMES S. SMITH, secretary and treasurer, Smith Facing & Supply Co., Cleveland, died May 5.

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LEROY BUSH, president of Romann & Bush Pig Iron & Coke Co., St. Louis, was found dead in his room at a hotel there as the result of a heart attack. He was 47 years old.

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WILLIAM H. TODD, president of the Todd Shipyards Corpn., New York, died as the result of a fall at his son's home in Brooklyn on May 15, aged 64 years. He was born in Wilmington, Del., and learned the trade of shipwright at the Pusey & Jones shipyard there. He came to New York in 1893 to work in the Brooklyn Navy Yard, and resigned three years later to become foreman of the Robins Dry Dock. After a number of rapid promotions, he was made president of the Robins Dry Dock & Repair Co. When the World War broke out, he organized the Todd Shipyards Corpn.

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WILLIAM H. BAKER, president of the Merritt-Chapman & Scott Corpn., New York, died of heart disease at his home in Montclair, N. J., on May 14, aged 52 years. He received his engineering degree at Cornell University in 1901. For some years before he joined the Merritt company, he was identified with the Atlas Portland Cement Co.

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RICHARD D. LITTLE, for nearly 30 years patent attorney in the Pittsburgh district for the United States Steel Corpn., died at his home in Braddock, Pa., on May 10. He was born at Johnstown, Pa., 62 years ago, but had been a resident of Braddock for 57 years. Mr. Little was active in local civic affairs, and was a member of the Association of Patent Attorneys.

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CADY B. DURHAM, former vice-president and assistant general manager of the Buick Motor Co., Flint, Mich., and widely known in the automobile industry, died on May 10 at a hospital in Miami, Fla., after an operation for appendicitis. He joined Buick in 1909 and later became works manager. In 1926 he was elevated to the vice-presidency and three years later retired. He was 58 years old.

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HOWARD E. MAYNARD, assistant chief engineer of the Chrysler Corpn., Detroit, died suddenly at his home on May 12. He became associated with the automobile industry in 1910 when he took a position with the United States Motors Corpn. He had since been employed with the Maxwell Motor Co., Chalmers Motor Corpn. and Chrysler.

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GEORGE MARSDEN, SR., founder of a number of metal-working industries in Janesville and Beloit, Wis., died May 8, aged 66 years. He was born in Markesan, Wis., moving to Janesville when a youth. He established the Badger State Machine Co. and the Rock River Machine Co. In 1906 he moved to Beloit and established the firms now known as the P. F. Mork Foundry Co. and the Hendley-Whittemore Co., manufacturing a general line of machinery. Mr. Marsden also founded the Wisconsin Farm Implement Co. of Beloit.

• • EDITORIAL

Metal Working Industry Awaits Market Leadership

A. I. FINDLEY
Editor Emeritus, The Iron Age

THE writer of a letter printed on page 1036 of THE IRON AGE of May 5 says that "the duty of a purchasing agent is to get maximum value for the money he spends." At the same time he holds that the responsibility for making prices on which the producer cannot get back his cost rests with sellers rather than buyers.

This correspondent finds a situation today in which "every manufacturer is falling over himself trying to quote a lower price than his competitor" and argues that a purchasing agent cannot put concern for the loss a given quotation may mean to the seller above his desire to buy his company's raw materials at as low prices as are available to its competitors, if not lower.

The letter quoted from above followed by a week the proposal of Joseph E. Gore, chairman of the national affairs committee of the Rochester (N. Y.) Purchasing Agents' Association, that the executive committee of the National Association of Purchasing Agents appoint a group of buyers to meet with representatives of the steel industry to discuss the establishment of base prices for steel that will allow "a fair return" to the manufacturers.

Probably no market question has been more discussed in THE IRON AGE than whether the spineless seller or the market-rigging buyer is the more responsible for profitless prices. So far as concerns steel, the makers have freely confessed their failings on unnumbered occasions.

Judge Gary's best remembered rôle as president of the American Iron and Steel Institute was that of mentor on the industry's price frailties. And in the past four years President Schwab in his diplomatic way and Vice-President Farrell in his blunter way have warned and pleaded to the end that steel makers might see and rise to the obligation to compete on the basis of live and let live.

The record shows that irregularities in steel prices have been more common in times of 75 to 85 per cent operation of the mills. In the great onset for low cost through large volume that marked the competition of 1927 and 1928, for example, producers cried out under the serious hurt of cut prices.

They made money, but the return on their enormous investments was so small, compared with long prevailing standards of manufacturing profits, that "profitless prosperity" soon found sanction as a legitimate addition to the vocabulary of business.

For months now the percentage of steel operations has been running in the low twenties. Before the country actually sank to these present depths so meager a use of steel was unbelievable. Scarcely can manufacturers realize that they were so foolish back in 1927-29 as to travel month after month the vicious circle of price cutting to increase sales volume, to get costs down, to get a still larger share of the business, and so on in the demoralizing round.

Under the chastenings of these last two years the thought may have entered their minds more than once that when a 50,000,000-ton steel year comes again, or even a 40,000,000-ton year, there will be no repetition of the price-cutting follies of the nineteen-twenties. Never again, they may have said, if haply prosperous times return, will they part so cheaply with millions of tons of ore and coal that cannot be replaced.

But what of the opportunity now before steel producers to reinforce the efforts of the Reconstruction Finance Corporation, the Federal Reserve System and all other agencies that are bending every energy to the checking of disastrous deflation?

Discussion of the comparative culpability of buyers and sellers for price declines may well give way to support of a courageous stand by sellers of steel. They hold a key position in the metal working industry—in all industry, in fact—and the course of the steel market at this juncture will be widely influential in every commodity market.

Whatever may have been the case in earlier months of the depression, when prices still yielded a profit and before fear had taken so tight a grip on the public mind, the present is no time for theoretically debating whether inflation or deflation is the way out.

Sellers and buyers of steel can have no divided interest in such a crisis. Manufacturing consumers of rolled steel are freely saying—and they are right—that the stabilizing of that product will go far toward turning the tide in the markets in which they sell.

It is for the steel producers to say "Thus far and no farther," as they face the crucial test which their market is now called on to meet. So saying and so acting, they will assert a market leadership the whole metal-working industry is waiting to see them take. More than that, they will help immeasurably to stem the current of price reductions that too long has gone unchecked in so many lines.

And still more, such a stand will be the best backing the industry could give to the President's strong summons to both parties in Congress to stop paltering and political maneuvering and soberly set about legislating to bring back confidence and save the nation's credit.

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Mentor for Steel

STEEL producers in particular and the metal-working industry in general will welcome a proposal that the American Iron and Steel Institute take a leading part in the field of the industry's economics. For some time the directorate has been considering with increasing favor a change of policy in this regard. When the announcement comes, even if this amounts at the moment to nothing more than an expression of the intent, the business world will accept the decision as highly constructive, of promise alike to producer and consumer of steel.

The industry itself will perceive potentialities for sta-

COMMENT • •

bilization, regularization, statistics and trade extension such as may be speeded up through the instrumentality of the superb organization that now exists. It may not be necessary to look for a dictatorship but rather direction from a mentor, clothed with considerable authority, armed with information, possessed of a broad viewpoint and commanding the respect of the industry's leaders. It will be a case of another industry determined on self-regulation, in its pursuit of health and expansion.

There is need for promoting further and new uses of steel. There are demands for fundamental research such as the whole industry should sponsor. There are times when caution should be emphatic respecting portentous mounting production, as in boom times. Outworn municipal ordinances that foolishly prohibit or curtail applications of steel must be revised. Tariff matters are preeminently of association concern, as is typified by the present activity of the Institute. And so on. It is from powerful, respected, well-informed groups that the country must get help whenever it attempts to study the cause and effect of industrial extremes.

The showing of the trends of consumption in steel is serious and makes imperative the cooperative search for markets. In the first decade after the war, consumption, as shown by compensating the ups and downs of production, was of the order of an annual increase of 2,000,000 tons. The increase averaged about 5 per cent annually in those years. And yet, it may be stated parenthetically, no later than 1929, because that year produced nearly 55 million tons against 50 million in 1928, there were those who talked of steel proceeding at a yearly increase of 10 per cent. As a matter of fact, the rate of increase over the last twenty years is only two-thirds of a million tons.

All of which means that the industry should have had its accepted leader who from his vantage point could have demanded a putting on of the brakes. Then perhaps the 1928 volume of production would not have been 20 per cent in excess of the consumption rate or that of 1929 over 25 per cent in excess. Then perhaps new capacity to the amount of practically 4 million tons for each of the last two years would not all have been built.

When it is substantially impossible to erect buildings with metal walls in a number of cities, something should be done about it in a concerted way. When steel products are standing the ravages of use better than expected, so that replacement is less frequent; when the character of product and the attitude of the public both make likely a longer useful life of the automobile, with postponed renewals; when deflated real estate renders inexpedient the razing of 15-story buildings to replace them with those of double the height—then there is clearly a demand to ascertain new avenues of consumption. Else the rate of expansion in consumption enjoyed in the 1919-28 decade will be long in coming.

Thanks to such suggestions as those contained in the Swope plan, the trade association is on the way to become an increasingly useful instrument in the conduct of business. The list is long of opportunities for the industry's good if the Institute decides to act as a clearing house of economic facts and business practices as well as of engineering data.

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Shall We Leave the Doors Open to Low-Priced Imports?

ONE may be opposed in principle to the system of high tariff barriers which has grown up throughout the world during this depression and at the same time agree with President Hoover, who stated in his veto message on the tariff bill amendment that "there never has been a time in the history of the United States when tariff protection was more essential to the welfare of the American people than at present. . . . Manufacturers in foreign countries which have abandoned the gold standard are producing goods and paying for raw materials in depreciated currency. They may ship their goods into the United States with great detriment to the American producer and laborer because of the difference in the value of the money they pay for their raw materials and the money they receive for their finished products."

Whatever may be the future policy of the United States in the matter of tariffs, the present situation seems to call for special treatment. A minority of the Senate Finance Committee, in dissenting from the majority report favoring inclusion in the pending tax bill of higher duties on copper, oil, coal and lumber, asks "Why single them out for special favor when every American industry is in the same distress?" It cannot be expected that immediate aid can be granted to every industry, but the industries mentioned are basic in American prosperity and are large employers of labor. If there is to be emergency tariff legislation of any sort a beginning might as well be made here as anywhere.

The minority report of the Senate Finance Committee resorts to the shopworn phrase that higher tariffs on these products "may adversely affect domestic consumers." Who are the consumers? The copper industry buys steel and the steel industry buys copper. Does the Senate minority refer to the ultimate consumer who may have to pay a little more for a copper gutter spout? Who is the gainer if commodities are continually sold at a loss? Not the employee, who is a consumer; not the producer, who is also a consumer, and certainly not the stockholder! We are all producers and consumers; if we cannot make a profit on what we produce we cannot gain very much from the low prices on what we consume. This elemental situation seems to have escaped most of the members of Congress, who continue to fight for the people when the people themselves—all of them, workers or producers —need protection for their jobs and for their diminishing capital as they have probably never needed it before in the history of this country.

Certainly our large domestic market upon which our industries must chiefly depend for business revival should not be left wide open to European commodities at prices which if equaled here would mean a further drastic readjustment of our entire economic and social structure.

Self-Liquidating Projects Would Take 1,000,000 Tons of Steel

WASHINGTON, May 17. — Differences between the Administration and Democrats in the Senate make it uncertain what shape the proposed relief program may take. Extreme pressure for quick action to relieve the unemployment situation and to stimulate industry has developed from many sources as the situation becomes more acute.

The President has said that, if necessary, emergency measures such as were applied in war time will be used. He expressed hope this contingency could be avoided and has gone on record in favor of aiding industry and employment through loans from the Reconstruction Finance Corporation.

Democrats are seeking a $2,000,000,000 construction program much of which would be loaned to States on self-liquidating projects, a proposal that has been urged by the American Legion and American Federation of Labor. The Administration is opposed to a bond issue unless assurance be given for balancing of the budget.

State self-liquidating projects involving perhaps as much as $1,000,000,000 or more and requiring upward of 1,000,000 tons of steel were outlined in the program of the American Legion and the American Federation of Labor and were inserted in The Congressional Record by Senator Pittman of Nevada. They are:

Bridge over the Mississippi River at New Orleans, costing $14,500,000, to be constructed jointly by the city of New Orleans and State of Louisiana. We understand the Southern Pacific Railroad has agreed to pay a rental for the use of the bridge sufficient to cover interest and sinking fund. Approximately 60,000 tons of steel involved.

Delaware River Joint Commission has authorized $10,000,000 to build high-speed subway system to connect Philadelphia and Camden. To be repaid by tolls.

California toll bridge authority, created by California Legislature, power to build bridge from San Francisco to Oakland. Cost approximately $75,000,000. To be repaid by tolls.

Portland-Tualatin tunnel through the hills west of Portland, Ore., authorized 1930. To be repaid by tolls.

Bridge St. Lawrence River. Engineering study completed. Cost approximately $4,000,000. To be repaid by tolls.

Thirty-eighth Street tunnel under Hudson River, costing approximately $90,000,000, authorized to be constructed by Port of New York Authority. Understand engineering work completed. To be repaid by tolls.

Triborough bridge across East River costing $30,000,000. Work already started, but stopped account lack of funds. To be repaid by tolls.

Hudson-Catskill bridge costing $3,500,000. Already authorized State of New York. Engineering work practically completed. To be repaid by tolls.

Hydroelectric power development Columbia River. Much of the necessary engineering work done. Probable cost upward $100,000,000. To be repaid by consumer charges.

Similar toll bridges, with engineering work done, projected in Chicago, St. Louis, Detroit, and Boston. To be repaid by tolls.

Large amounts of waterworks for communities of size projected and engineered. Estimated amount between $300,000,000 and $500,000,000. To be repaid by tolls.

Cold-Finished Bar Trade to Adopt Quantity Differentials

ADOPTION of a new price policy in the cold-finished steel bar industry, with established differentials for quantity, is promised by the issuance of a new card of extras by a large Pittsburgh district producer. The new plan, which was scheduled to become effective on all new business taken after May 15 and on contract tonnage after June 30, provides for a base price of 1.70c. a lb. on all specifications of 10,000 lb. and over of a single size and grade, released for shipment at one time to one destination. Smaller quantities are subject to extras ranging from 10c. to $2.50 a 100 lb., depending upon the amount involved. Other producers have already signified their intention of adopting similar extras, which are to apply without deviation to both large and small buyers, and to both jobbers and manufacturers. Basing points will be continued at Pittsburgh, Cleveland, Buffalo and Chicago as heretofore, and although the base price is $4 to $6 a ton under recent quotations, the strict application of quantity extras will prevent any corresponding decline in the average selling price of mills.

The new quantity extras are to apply as follows:

10,000 lb. and over,	no extra.
6,000 to 9,999 lb.,	10c. per 100 lb. net.
4,000 to 5,999 lb.,	20c. per 100 lb. net.
2,000 to 3,999 lb.,	40c. per 100 lb. net.
1,500 to 1,999 lb.,	60c. per 100 lb. net.
1,000 to 1,499 lb.,	90c. per 100 lb. net.
500 to 999 lb.,	$1.50 per 100 lb. net.
300 to 499 lb.,	$2.00 per 100 lb. net.
Less than 300 lb.,	$2.50 per 100 lb. net.

The following sizes in rounds and hexagons and squares shall be considered standard: By 64ths to 1 in. inclusive; by 32nds over 1 to 2 in. inclusive, and by 16ths over 2 in. to makers' limit. All other sizes, as well as sizes with limits not entirely within the standard manufacturing tolerances of a standard size are classified as "odd and intermediate" sizes, and an extra of 25c. per 100 lb. will be charged. However, this extra will not be charged on 10,000 lb. or more of one size and grade, released for shipment at one time.

No other radical changes in the new extra list are apparent. Extras for accuracy are generally lowered, while standard manufacturing tolerances, formerly more rigid on shafting than on production material, are now all on a narrower shafting basis. Some of the extras on rounds and hexagons have been revised, and the extra on Bessemer screw stock has been advanced. Some changes in chemical specifications are also noticeable. The entire list has been generally clarified and improved.

A part of the new extras are reproduced in the accompanying tables.

April Sheet Sales Gained; Production Lower

Sales of steel sheets gained slightly in April over March, according to the monthly report of the National Association of Flat Rolled Steel Manufacturers. However, production and shipments showed a decrease and unfilled tonnage May 1 was somewhat below that on April 1. The April report and comparison in net tons follow:

	April	March	Feb.
Sales	103,011	101,559	108,441
Production	101,559	110,559	124,157
Shipments	104,637	117,685	116,715
Unfilled orders	99,510	102,171	118,022
Unshipped orders	45,021	55,331	51,485
Unsold stocks	71,318	68,677	72,857
Capacity per month	555,000	555,000	555,000
Percentage reporting	68.7	68.7	68.7
Percentages, Based on Capacity			
Sales	27.0	26.6	28.4
Production	26.6	29.0	32.5
Shipments	27.4	30.8	30.6
Unfilled orders	26.1	26.8	30.9
Unshipped orders	11.8	14.5	13.5
Unsold stocks	18.7	18.0	19.1

Trackwork Shipments Best Since September

Shipments of trackwork for T-rail track of 60 lb. and heavier in April, amounting to 3340 net tons, were slightly higher than in March and were the largest for any month since last September, according to the monthly report of the American Iron and Steel Institute. This total, however, was about 60 per cent less than that in April last year, when deliveries aggregated 8564 net tons. Total shipments in the first four months of this year were 12,270 net tons, compared with 29,455 net tons in the corresponding period in 1931.

SUMMARY OF THE WEEK'S BUSINESS

Automobile Orders Aid Steel Output at Detroit and Cleveland

Great Lakes Plant Operating Full—Other Lines Showing Only Minor Improvement But Construction Projects Are Accumulating

INFLUENCED mainly by orders from the automobile industry, principally Ford, steel ingot production for the country has risen a point to 25 per cent, against 24 per cent in the two preceding weeks. Engagement of steel-making capacity shows marked contrasts, the Pittsburgh district rate having declined from 20 to 18 per cent, the lowest in many years, while Cleveland plants are operating at 38 per cent, against 26 per cent last week. The Detroit district, including the Ford steel plant, which has less than 2 per cent of the country's ingot capacity, has by far the best production, 81 per cent. The Great Lakes plant at Detroit is operating all of its open-hearth furnaces.

This contrast in producing activities finds a counterpart in the price situation. On the one hand, steel producers are successful in maintaining firm quotations on finished steel and may be laying the groundwork for a further advance by extending to billets and slabs the $2 a ton rise in the price of sheet bars announced a week ago. Raw material prices, however, continue to decline, heavy melting steel having touched new all-time lows at Pittsburgh and Chicago, bringing THE IRON AGE scrap composite down to $7.41 a gross ton from $7.62 a week ago. There is also a new low since August, 1915, in the pig iron composite price, which is now at $14.06, against $14.22 a week ago, because of a general reduction of 50c. a ton at Pittsburgh and in the Valley. Meanwhile, the finished steel composite price is unchanged at 2.087c. a lb.

THE determination of steel producers to adhere to a level of prices that will give them the full benefit of savings accruing from wage reductions that went into effect this week is one of the strongest factors in the steel situation, it being conceded that without such aid in cutting down losses some of them might face financial difficulties before the end of the year if business volume does not gain substantially. The fact that some large consumers are apparently convinced now that steel prices will be maintained is indicated by an inquiry from a large fabricator of automotive parts for price protection through the first quarter of next year. Some third quarter inquiry for alloy steel bars has also appeared. Mills are not disposed to quote beyond this quarter on any product.

Under present conditions, the handling of many small orders increases costs, and the makers of cold-finished steel bars have taken steps to remedy this by putting into effect quantity extras. The new base price of 1.70c. a lb., which is for lots of 10,000 lb. or more, is a reduction, but the average net price to the makers will be increased through the imposition of extras up to $2.50 per 100 lb. for smaller lots. A similar plan for sheet steel was recently proposed by some sheet producers, but did not proceed beyond the initial stage.

WHILE the Ford Motor Co.'s orders in the week have totaled only about 8000 tons, about half of this went to a Cleveland mill. A larger steel purchase by Ford for June requirements is expected about May 25. The Ford plant is making steady progress in expanding schedules, producing 2000 cars a day. It now appears that the objective of 100,000 cars a month will not be attained before July, the tentative schedule for June indicating an output next month of 60,000 to 65,000. However, Ford's program assures a good summer performance compared with March, April and May. Other makers of low-priced cars are also gaining.

ASIDE from automobile business, steel orders are not making noteworthy gains, although it is significant that orders for bars, the most widely used steel product, have increased noticeably in at least two districts, Chicago and Cleveland. Track supply business is also better, particularly at Chicago, as railroads begin spring maintenance work. A fairly large volume of structural steel work has accumulated, but lettings are delayed. At least two large projects in the New York district are held up pending settlement of the building trades strike. About 60,000 tons of steel for electrification work on the Pennsylvania Railroad will be released upon completion of financing arrangements. If Congress approves of a bond issue or the advancing of funds by the Reconstruction Finance Corporation for a list of self-liquidating projects that have passed the engineering stage, upward of 1,000,000 tons of steel would be required, although deliveries in some cases would extend over two or three years.

Large tonnage orders and inquiries have been few the past week, but the high spots are an order for 8400 tons of pipe for export to Asia Minor, a prospective gas line in New York State that will take 3500 tons and an order for river barges placed at Pittsburgh calling for 2200 tons, mostly plates.

Efforts of the steel industry to prevent the use of foreign steel in public work have received a setback in New York State, the Attorney General having ruled that departments cannot make such preference without legislative authority, which does not exist.

▲▲▲ A Comparison of Prices ▲▲▲

Market Prices at Date, and One Week, One Month and One Year Previous, Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron

	May 17, 1932	May 10, 1932	Apr. 19, 1932	May 19, 1931
Per Gross Ton:				
No. 2 fdy., Philadelphia	$14.84	$14.84	$15.59	$17.26
No. 2, Valley furnace	*14.50*	15.00	15.00	17.00
No. 2 Southern, Cincinnati	13.82	13.82	13.82	14.69
No. 2, Birmingham	11.00	11.00	11.00	12.00
No. 2 foundry, Chicago*	16.00	16.00	16.00	17.50
Basic, del'd eastern Pa.	16.00	16.00	16.00	17.00
Basic, Valley furnace	*14.00*	14.50	14.50	16.50
Valley Bessemer, del'd P'gh	*16.89*	17.39	17.39	18.76
Malleable, Chicago*	16.00	16.00	16.00	17.50
Malleable, Valley	*15.00*	15.50	15.50	17.00
L. S. charcoal, Chicago	23.17	23.17	23.17	25.04
Ferromanganese, seab'd carlots	†75.00	†75.00	†75.00	80.00

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

†Ferromanganese quotations adjusted to carload unit; larger quantities at discount.

Rails, Billets, etc.

Per Gross Ton:				
Rails, heavy, at mill	$43.00	$43.00	$43.00	$43.00
Light rails at mill	34.00	34.00	34.00	36.00
Rerolling billets, Pittsburgh	27.00	27.00	27.00	29.00
Sheet bars, Pittsburgh	26.00	26.00	26.00	29.00
Slabs, Pittsburgh	27.00	27.00	27.00	29.00
Forging billets, Pittsburgh	33.00	33.00	33.00	35.00
Wire rods, Pittsburgh	37.00	37.00	37.00	35.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb.	1.60	1.60	1.50	1.65

Finished Steel

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Bars, Pittsburgh	1.60	1.60	1.60	1.65
Bars, Chicago	1.70	1.70	1.70	1.70
Bars, Cleveland	1.65	1.65	1.65	1.65
Bars, New York	1.95	1.95	1.95	1.98
Tank plates, Pittsburgh	1.60	1.60	1.60	1.65
Tank plates, Chicago	1.70	1.70	1.70	1.70
Tank plates, New York	1.898	1.898	1.898	1.93
Structural shapes, Pittsburgh	1.60	1.60	1.60	1.65
Structural shapes, Chicago	1.70	1.70	1.70	1.70
Structural shapes, New York	1.86775	1.86775	1.86775	1.90½
Cold-finished bars, Pittsburgh	*1.70*	2.00	2.00	2.10
Hot-rolled strips, Pittsburgh	1.40	1.40	1.40	1.55
Cold-rolled strips, Pittsburgh	2.00	2.00	2.00	2.15

Finished Steel

Per Lb. to Large Buyers:	May 17, 1932 Cents	May 10, 1932 Cents	Apr. 19, 1932 Cents	May 19, 1931 Cents
Hot-rolled annealed sheets, No. 24, Pittsburgh	2.20	2.20	2.20	2.15
Hot-rolled annealed sheets, No. 24, Chicago dist. mill	2.30	2.30	2.30	2.35
Sheets, galv., No. 24, P'gh	2.85	2.85	2.85	2.80
Sheets, galv., No. 24, Chicago dist. mill	2.95	2.95	2.95	2.90
Hot-rolled sheets, No. 10, P'gh	1.55	1.55	1.55	1.70
Hot-rolled sheets, No. 10, Chicago dist. mill	1.65	1.65	1.65	1.80
Wire nails, Pittsburgh	1.95	1.95	1.95	1.80
Wire nails, Chicago dist. mill	2.00	2.00	2.00	1.95
Plain wire, Pittsburgh	2.20	2.20	2.20	2.20
Plain wire, Chicago dist. mill	2.25	2.25	2.25	2.25
Barbed wire, galv., Pittsburgh	2.60	2.60	2.60	2.55
Barbed wire, galv., Chicago dist. mill	2.65	2.65	2.65	2.60
Tin plate, 100-lb. box, P'gh	$4.75	$4.75	$4.75	$5.00

Old Material

Per Gross Ton:				
Heavy melting steel, P'gh	*$9.50*	$9.75	$10.00	$11.25
Heavy melting steel, Phila.	6.50	6.50	7.25	9.50
Heavy melting steel, Chicago	*6.25*	6.62½	6.87½	8.75
Carwheels, Chicago	6.50	6.50	7.00	8.75
Carwheels, Philadelphia	9.00	9.00	9.50	12.00
No. 1 cast, Pittsburgh	9.25	9.25	9.50	11.00
No. 1 cast, Philadelphia	*8.00*	8.50	9.00	11.50
No. 1 cast, Ch'go (net ton)	6.50	6.50	7.00	9.00
No. 1 RR. wrot., Phila.	8.50	8.50	8.50	11.00
No. 1 RR. wrot., Ch'go (net)	4.25	4.25	5.50	7.50

Coke, Connellsville

Per Net Ton at Oven:				
Furnace coke, prompt	$2.25	$2.25	$2.25	$2.30
Foundry coke, prompt	3.00	3.00	3.50	3.50

Metals

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York	5.75	5.75	6.00	9.12½
Electrolytic copper, refinery	*5.12½*	5.50	5.50	8.75
Tin (Straits), New York	*20.37½*	20.65	19.00	23.50
Zinc, East St. Louis	*2.30*	2.50	2.75	3.35
Zinc, New York	*2.67*	2.87	3.12	3.70
Lead, St. Louis	2.90	2.90	2.90	3.60
Lead, New York	3.00	3.00	3.00	3.75
Antimony (Asiatic), N. Y.	*5.30*	5.35	5.87½	6.50

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

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▲▲▲ The Iron Age Composite Prices ▲▲▲

	Finished Steel	Pig Iron	Steel Scrap
May 17, 1932	2.087c. a Lb.	$14.06 a Gross Ton	$7.41 a Gross Ton
One week ago	2.087c.	14.22	7.62
One month ago	2.087c.	14.35	8.04
One year ago	2.114c.	15.79	9.83
	Based on steel bars, beams, tank plates, wire, rails, black pipe and sheets. These products make 87 per cent of the United States output.	Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.	Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	Finished Steel High	Finished Steel Low	Pig Iron High	Pig Iron Low	Steel Scrap High	Steel Scrap Low
1932	2.087c., Mar. 29	2.037c., Jan. 19	$14.81, Jan. 5	$14.06, May 17	$8.50, Jan. 12	$7.41, May 17
1931	2.142c., Jan. 13	2.052c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.362c., Jan. 7	2.121c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.412c., April 2	2.362c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3
1928	2.391c., Dec. 11	2.314c., Jan. 3	18.59, Nov. 27	17.04, July 24	16.50, Dec. 31	13.08, July 2
1927	2.453c., Jan. 4	2.293c., Oct. 25	19.71, Jan. 4	17.54, Nov. 1	15.25, Jan. 11	13.08, Nov. 22
1926	2.453c., Jan. 5	2.403c., May 18	21.54, Jan. 5	19.46, July 13	17.25, Jan. 5	14.00, June 1
1925	2.560c., Jan. 6	2.396c., Aug. 18	22.50, Jan. 13	18.96, July 7	20.83, Jan. 13	15.08, May 5

Pittsburgh Ingot Output Declines; Pig Iron Reduced 50c. a Ton

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PITTSBURGH, May 17.—Gradually increasing specifications from the automobile industry have not been sufficient to hold up Pittsburgh district steel operations in one of the quietest weeks in the history of the local industry. Aggregate releases of finished steel products continue at what many believe is an irreducible minimum, despite the fact that some important lines are barely holding their own.

In spite of depressing current conditions, sentiment continues fairly good, as automotive orders, structural awards and deferred releases on tin plate are still counted upon to bring relief to the trade within the next month. Other consuming lines offer little hope, although a better demand for oil country goods is expected at some time during the year.

The problem confronting local industry is whether improved demand from the above-mentioned sources can be maintained through the summer, and whether it will be sufficient to prevent further seasonal decline in activity during June and July.

Despite a temporary lull in new buying by automobile companies, specifications against old contracts are expanding, and further purchases are in prospect. Sheet production is off slightly, but strip steel is holding its own. Tin plate users continue to defer commitments, and tin mill operations are barely holding at the recent 45 per cent level.

Orders for structural steel and reinforcing bars are slow in being placed, despite the heavy volume of inquiry. An order for river barges calls for 2200 tons of plates. Pittsburgh district mills will also share in an order for 8400 tons of line pipe for export to Asia Minor.

Steel ingot production in the Pittsburgh district has declined to 18 per cent of capacity, largely because of curtailment on the part of the larger interests. However, the smaller independent companies are running their steel plants intermittently, with complete suspension every week or fortnight becoming more common. Output in the Wheeling district has dropped to 40 per cent, while Youngstown mills average about 25 per cent.

Finished steel prices have been given further support by a $2 a ton advance in quotations on billets, slabs and sheet bars, to apply in the third quarter. Also in line with a better established price structure is the

In one of the quietest weeks in history of Pittsburgh steel industry, ingot output slips to 18 per cent.

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Increases in automobile orders not sufficient to offset declines elsewhere.

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Pig iron reduced 50c. a ton in Valley and at Pittsburgh.

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Billets and slabs, as well as sheet bars, to be advanced $2 a ton.

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Heavy melting steel drops to a new low point.

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adoption of a new one price base by makers of cold-finished bars and shafting, which provides for graduated extras on small lots. Talk of advances in other finished steel prices is still heard, but no definite statement on third quarter quotations has come to light.

The raw materials market is decidedly weak, with reductions on pig iron and coke, and decided weakness in some forms of scrap.

Pig Iron

Small sales of the principal grades of pig iron in both the Valley and the Pittsburgh district have resulted in reductions of 50c. a ton in quoted prices. A consumer in the immediate Valley territory has bought foundry iron at $14.50, and the usual 50c. differential prevails on Bessemer and malleable. The Pittsburgh district seller is offering all three grades rather freely at $15.50, Pittsburgh furnace. No substantial purchases have been made to test the new prices, and they cannot be considered the minimum at which any large tonnage might be available. Consumption of pig iron is falling under April levels. Many foundries are entirely suspended. The requirements of the largest radiator and sanitary ware makers in the district represent an operation of less than 20 per cent.

Semi-Finished Steel

Leading sellers of billets, slabs and sheet bars have announced that their third quarter price on all three products will be $28, Pittsburgh or Youngstown. This will represent an advance of $2 a ton on sheet bars, and $1 to $2 on billets and slabs. This is in line with an effort being made to strengthen finished steel prices. A corresponding advance will probably be made in forging billets. Wire rods are unchanged at $37, Pittsburgh, and no indication of third quarter prices has appeared.

Rails and Track Supplies

This market is unusually quiet, with action postponed on any important inquiry which has appeared heretofore. The New York Central has not yet purchased its rail and accessory requirements, for which inquiry was made several weeks ago. Specifications of other Eastern carriers are very light, and little new buying seems to be in prospect.

Bars, Plates and Shapes

Business has been rather quiet in the past week, although inquiry continues to come out in fair volume. An independent barge line has placed orders with the American Bridge Co. for 12 barges, requiring 2200 tons of plates. Some other barge inquiry before the trade is expected to be acted upon in the near future. Reinforcing bars seem to be growing more active, but are rather sluggish for this season of the year. Merchant and alloy steel bars are moving to the automobile trade in slightly improved volume, but the gain has not been sufficient to boost operations very much. Prices are well maintained at 1.60c., Pittsburgh, on current new business, but a severe test of the market is still lacking. Third quarter prices have not come out, and reports that a $1 a ton advance will be made cannot be verified.

Cold-Finished Steel Bars

Leading producers have generally adopted the new basing system on cold-finished steel bars and shafting, which is discussed at more length on another page. Under the new plan cold-finished bars are quoted at 1.70c. a lb. on lots of 10,000 lb. or more for shipment to one destination at the same time. Smaller quantities are to take differentials ranging from 10c. to $2.50 a 100 lb. Turned and ground shafting will be quoted on the new base at 2.05c. to 3c. a lb., depending upon size. This material will also be subject to the new standard classification.

Bolts, Nuts and Rivets

No change in demand is reported, and production is holding at about

15 per cent of capacity. Prices are fairly well held at reecnt levels.

Tubular Goods

Two Pittsburgh mills will share in an order for 8400 tons of 10¾-in. line pipe placed for export by the Irak Petroleum Corpn. Rolling of this material will probably get under way early in June. No other line pipe business is reported, and definite inquiry is still lacking. Drilling pipe and other oil country goods are moving fairly well in the east Texas and adjacent fields, but demand from California is negligible. Standard pipe is very dull, and demand for mechanical tubing shows scarcely any change. Changes in specifications on both carbon and alloy steel tubes for gasoline cracking plants have been announced.

Wire Products

The wire business is holding its own, with a tendency toward improvement in evidence on some lines. Fencing is a little more active in certain localities, but general increases are lacking. The same might be said of merchant wire products in general, but the automobile trade is taking manufacturers' wire in improved volume. Prices are well maintained at 2.20c., Pittsburgh, on manufacturers' wire, and $1.95 a keg on nails.

Sheets

Sheet demand suffered some contraction last week because of a temporary lull in automobile buying. As a result, production has declined slightly, and averages only about 23 per cent of capacity. A few individual mills are maintaining a considerably better rate, while producers of the more common finishes of sheets are not doing as well. Nevertheless, the gradually expanding schedules of the principal automobile makers are expected to benefit the sheet industry generally during the next month. Electric refrigerator makers are reaching the end of their busy season, and no other line has arisen to offset this loss of tonnage. Stove makers are a little more active in some territories.

No official action has been taken on third quarter prices, although some mills are said to contemplate advances. Recent efforts to boost semi-finished steel prices would indicate that some further upward revision might be announced in sheets.

Tin Plate

Specifications have shown no increase despite the fact that May 15 is the date on which July specifications are expected to be in. However, the full effects of such tonnage will probably not be felt for another week. In the meantime, the industry is barely maintaining a 45 per cent rate of production, as the large can companies are hesitant in making commitments. Crop reports to date have not been unfavorable, but surplus stocks of canned goods have forced prices down to a point at which the smaller canners cannot operate profitably.

Strip Steel

Demand is spotty and occasional increased tonnage as reported by some mills is not shared by the entire industry. Heavier automobile purchases are expected during the week, but demand from other sources shows no prospect for early improvement. Prices are holding on current small-lot orders, and some producers contemplate holding to 1.50c. and 1.60c., Pittsburgh, on hot-rolled strip for third quarter delivery. The market has recently been quotable at a range of $2 under these figures. Cold-rolled strip is well held at 2c.

Coke and Coal

The coke business seems to be duller than ever in the complete absence of demand on the part of many foundries. Larger consumers are taking a little coke from time to time, but have little effect upon the market. Prices on the premium grades of foundry coke have been reduced from $4.50 to $4.25 a ton in open cars, a decline of 25c. Ordinary foundry coke is quoted at less than $3 in some instances. Furnace coke is unchanged. Slack prices have eased off further and are now down to the approximate levels which existed before the eastern Ohio strike became a factor in the market.

Scrap

Despite a sharp break in the price of hydraulic compressed sheets, the market on No. 1 heavy melting steel is lower only because of the figure at which dealers are able to purchase this grade of scrap. Very small sales into consumption at $10 are still reported, and the promise of further purchases at this figure has not entirely disappeared. However, hydraulic bundles have been purchased by consumers at $9 and $9.25, and dealers have been able to buy at as low as $8.50 and $8.75 for shipment against old contracts. It is significant that both Michigan and local bundles are available at such low prices. Machine shop turnings have also declined sharply on a mill purchase at $6. A $1 range on blast furnace material is necessitated by recent consumer purchases. Declines in the other grades have been nominal, and the entire market is subject to further decline because of the anxiety of dealers to get orders at any price.

Dealers in scrap were encouraged by the prospects that an East Side melter would come into the market this week for a small tonnage of melting steel. It is understood that the leading consumer of busheling and borings will not make further purchases until about July 1. No. 1 locomotive tires are 75c. a ton lower. Railroad lists: Chicago, Milwaukee & St. Paul, 600 tons; Chicago, Burlington & Quincy, 6200 tons and Louisville & Nashville, 19,000 tons.

New England Pig Iron Sales Very Small

BOSTON, May 17.—Less pig iron was sold the past week than in any similar period within the memory of furnace representatives. The aggregate was about 200 tons. Some foundries with iron on hand for which they have no use are selling truckloads to others that have small orders for castings. The Draper Corpn., Hopedale, Mass., reported in the market for 1000 tons, simply asked quotations from furnaces for estimating purposes. Prices are unchanged.

A New England roller of reinforcing bars has for some time been purchasing foreign billets used as ballast at 99c. per 100 lb., on dock Boston. Another reinforcing steel house has been handling foreign bars for some time. Competition from these interests has checked any attempt to secure better prices for domestic billet bars.

St. Louis Steel Plants Operating at Low Rate

ST. LOUIS, May 17.—Spot business, mostly carload orders, is the rule in the pig iron market. When a melter gets an order he buys the necessary raw materials to fill it, and no more. Operations in the St. Louis industrial district are at very low ebb. An East Side melter has taken off an open-hearth furnace, and now operations are at about 8 per cent of the district's capacity.

Canadian Business Has Shown Improvement

TORONTO, May 16.—General conditions in the iron and steel industry of Canada are somewhat better than they were at the beginning of the year. Plant operations now average between 30 and 35 per cent of capacity. The improvement in operations is reflected in a slightly better demand for merchant pig iron.

Scrap

The betterment in business in other branches of the steel industry has had but little effect on this market. Sales are largely of a specialized nature, with most lines in a state of stagnation. Steel scrap is moving slowly with practically no call from the Hamilton district, although occasional sales are being made to smaller consumers in Ontario and the Montreal districts. Dealers are picking up specialties, but otherwise are out of the market and have made no revision in price lists.

Chicago Steel Sales Gain Slightly; Operations Not Much Improved

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Although new sales and specifications for some steel products are gaining, the aggregate is not sufficient to raise ingot output materially.

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Automobile business and railroad track material aiding in such business improvement as has occurred.

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Scrap prices develop further weakness, with new low for heavy melting steel.

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CHICAGO, May 17.—Sales and specifications show a slight tendency to creep forward under the influence of needs of manufacturers of low-priced automobiles and the railroad's increasing activity in right-of-way improvement. Rails are being ordered out at a uniform rate and track supplies are moving in larger volume. A few small bridge repair inquiries are now coming from railroads.

A mail order seller of farm equipment reports sales above last year's and well sustained for this time of year. Other farm implement manufacturers find stocks in warehouses diminishing and are rather well engaged on farm machinery repairs, which seem to be on the increase because of existing conditions.

Reports are more numerous of increasing activity in engineering and drafting departments, which is considered to be a good omen.

Ingot output ranges from 20 to 21 per cent of capacity.

Pig Iron

May shipments and sales of Northern foundry iron are showing little variation from the rate in April, and the near future is still obscure as to any tendency upward. Prices seem to be better established at $16 a ton, local furnaces, but there is no tonnage business to afford a real test. Southern iron is steady in price, with very small quantities moving into this market. Silvery quotations are variable in a dull market.

Bolts, Nuts and Rivets

Spot sales are at a very low level, and specifications show no improvement over the average of recent weeks. Price policies for third quarter will be known with the opening of contracting, which will be under way in a few weeks.

Plates

Local car shops are preparing to begin work on a few small orders, but they have nothing in sight that will lift operations to an appreciably higher level. Small orders for car repair parts are more numerous than earlier in the year. Merchant pipe is moving in larger volume, but large diameter pipe such as is used for gas and oil is quiet and local sellers cannot point to an active project that is financed and ready to go ahead. Tank work is confined to a few scattered and small municipal water plant projects.

Structural Material

Although awards are more numerous, it is noticeable that for the most part they are small. The local building situation promises little for the early summer months. The Post Office at St. Paul and several private projects in surrounding territory may be awarded before the end of the month. In Chicago there is little to look forward to except several of the World's Fair buildings.

Cast Iron Pipe

The gain in activity that was recently noted in this market is holding, but the structure still lacks the support of round tonnages. Neenah and Madison, Wis., have placed small orders and sellers report that new tonnages of small size are taking shape. Although there is no concerted move toward a price advance, there is less tendency to cut sharply on the miscellaneous business that now represents the bulk of activity.

Rails and Track Supplies

The Great Northern is already specifying against its recent rail contract and other Western railroads are more active with track work. New rails going into track are in small tonnage, but replacement of accessories is resulting in rather liberal purchases and specifications, new orders this week being for 3000 tons. Track accessory departments are better engaged than rail mills.

Wire Products

Recent gains in shipments are holding and there is promise of a heavier movement in the Detroit territory. Some agricultural districts continue to show improvement. Production is lagging behind the movement from stocks, but is ample to meet the mixed character of shipments. Nails are in slightly larger demand, though the volume is below usual spring proportions. Demand for wire products is above the general level of other steel mill products.

Cold-Rolled Strips

Operations have dropped several points to 17 per cent of capacity, but new business is in sight that may result in regaining lost ground. Prices are steady at 2c. a lb., Cleveland.

Sheet Bars

Some sellers are ready to announce an advance of $2 a ton. Demand in this district is light.

Sheets

Reports are heard of advances of $2 to $3 a ton, but local sellers are not ready to announce their attitude as to third quarter prices. Sales are light and in extremely small lots, making production schedules very unsatisfactory.

Bars

This commodity still shows a disposition to grow in use among small consumers, and specifications are slightly larger from manufacturers of small automobiles. Farm implement makers are taking some bars for repair work, which is an important factor with them at this time. Rail steel bar mills have irregular schedules which average about 25 per cent of capacity.

Reinforcing Bars

Fresh inquiries are above the level of recent weeks, but tonnages sought are usually very small and many projects are not financed. Awards remain very light. Prices once again appear to have reached a steady footing after wavering under pressure of severe competition by mills outside of this district. Road contractors are gradually taking larger tonnages.

Scrap

Heavy melting steel has sold off 25c. a ton and further weakness is indicated by dealers being able to purchase this grade at $6 a ton. Malleable grades are also off 25c., and a sale of brake shoes establishes a new low level for prices. Foundry grades are among the dullest on the list.

Eastern Pennsylvania Steel Outlook is More Promising

Financing of Pennsylvania Railroad Electrification Will Release 60,000 Tons—7845 Tons of Foreign Pig Iron Arrives

PHILADELPHIA, May 17.—While the iron and steel market continues to drag, it will receive stimulus of exceptional proportion in these times when the Pennsylvania Railroad resumes electrification work between New York and Washington. The loan of $27,500,000 arranged with banker and investment channels will be supplemented by $13,000,000 from the railroad's treasury for initial use. This total of $40,500,000 will be added to by $27,500,000 from the Reconstruction Finance Corporation Oct. 1. Releases of 60,000 tons of steel, and orders from electric and other manufacturers will spread the business widely and, it is said, will cause the employment of 26,000 men. The steel business will not be in the nature of new purchases, but it will mean rolling on suspended orders, since only a small amount had been rolled. The trade is anxiously awaiting the releases.

Operations remain practically unchanged at 15 per cent of capacity. Prices are apparently holding well, as shown by efforts of the past week to sound out the market on heavy and light rolled products.

Pig Iron

Inquiry is light. Small lots of resale foreign iron are reported to have been moved at the domestic quotations. This has been learned by the trade with interest in view of claims that the foreign material was being sold at considerably less than that offered by Eastern furnaces, which are quoting $14 to 14.50, base furnace.

Plates, Shapes and Bars

There has been a quiet sounding of the market, and it is said to have disclosed the fact that mills are adhering well to the second quarter level of 1.60c., base Pittsburgh. New business is small, but a relatively sharp impetus for mills in the East especially is looked for by releases from the Pennsylvania Railroad for electrification work. Current levels are less than those that prevailed when the orders were placed. The oil industry is indicating more interest in prospective tankage requirements. The trade is making no prophecy as to when the depression will lift, but is confident that when it does unusually heavy orders will come from the carriers and other users.

Sheets

There has been a moderate upturn in sheet requirements placed with eastern Pennsylvania mills. Part of the new business is for farm use. This marks the first improveemnt of this nature for a long period. It may be only a passing turn, but has elicited considerable interest. Automotive business is nil. One body builder has moved up operations somewhat on orders for the new Fords.

Imports

Pig iron imports at Philadelphia last week totaled 7845 tons, of which 6845 tons came from the Netherlands and 1000 tons from British India. Twenty-five tons of ferromanganese from Norway also arrived. There were no steel arrivals.

Scrap

The market is extremely dull and makes the determination of prices difficult. Heavy melting steel, however, clearly shows a stronger tone as indicated by the quotations of dealers. Releases are small.

Ensley Rail Mill with Blast Furnaces and Open-Hearth May Soon Be Shut Down

BIRMINGHAM, May 17.—At a time when their melt should be steadily increasing, pipe plants are finding it difficult to maintain operations even on a small scale and this condition is one of the most important limitations upon the pig iron market at this time. The demand from jobbing foundries is particularly slim. It was hoped that May would at least maintain the April rate, but this is now doubtful, as buying and shipments are becoming slower. Some foundries are now asking that iron bought as late as the first of the month for current shipment be delayed until further notice. The foundry make of only two furnaces is not even being moved. Quotations continue on a $11 base for the Southern market. Furnace operations are unchanged from seven active stacks, three being on basic, two on foundry, one on recarburizing and one on high silicon iron.

Steel

Current buying is unchanged from an aggregate of small tonnage orders calling for various items and providing very little of a substantial nature for any one line. For weeks there has been no particular activity and the market has settled to a slow, steady pull. Prices are holding firm. Steel production will be materially decreased at the end of the month, when the Ensley rail mill of the Tennessee Coal, Iron & Railroad Co. closes down. Blast furnaces and open-hearths whose output was required to supply the rail mill also will be shut down. The Tennessee company is now operating five open-hearths at Ensley and four at Fairfield. Gulf States Steel has two active at Alabama City. The same schedules will be followed throughout the present week, making a total of 11 units out of 24 active in the State.

Pacific Coast Awards of Steel Are Small

SAN FRANCISCO, May 16.—The past week has been rather quiet in steel trade in this territory. Reported lettings of steel projects call for less than 1000 tons, mostly in small work. New inquiries call for less than 2000 tons, including 1000 tons of reinforcing bars for the Los Angeles *Times* Building. The fabricated structural steel for this job, amounting to 6000 tons, was awarded in March to the Consolidated Steel Co. The general contracts have been awarded for a county bridge at Sacramento, calling for 900 tons of steel, and a State highway bridge in Snohomish County, Wash., requiring 800 tons. Los Angeles has awarded 200 tons of wire rope to the Pacific Wire Rope Co. and John A. Roebling's Sons Co. and also 150 tons of barbed wire, posts and fencing to the Pacific Fence Construction Co.

The East Bay Municipal Utility District at Oakland has called for bids by May 27 on 1000 tons of cast iron pipe. This is the only important cast iron pipe inquiry this month.

Adams Grease Gun Corpn., New York, after concluding patent infringement controversy with Alemite Corpn., Chicago, has been licensed to continue manufacturing and selling its products under Alemite patents covering Alemite-Zerk-Dot and industrial lubricating systems. All jobbers having injunctions against them are now free to sell licensed Adams greasing equipment without infringement of patent rights.

Ford Business Lifts Steel Production at Cleveland

Ingot Rate Rises to 38 Per Cent—Merchant Bars More Active—Some Consumers Seeking Forward Coverage

CLEVELAND, May 17.—New orders for finished steel were placed by the Ford Motor Co. during the week. A Cleveland mill shared in this business with orders for 4000 tons of sheets and hot and cold-rolled strip. This business has enabled this local producer to put on four open-hearth furnaces, thus increasing local operations 12 points to 38 per cent of ingot capacity, the best district average since the middle of March. With the new Ford tonnage, finishing mill operations were stepped up this week. Orders for the heavier rolled steel products increased slightly in this territory during the week. This was the first sign of an actual improvement in a long time and gave the steel industry a somewhat more cheerful feeling. The gain was largely in bar products. Orders are only for small lots and many consumers demand delivery services that producers are unable to furnish because for reasons of economy they cannot start up an idle mill to fill only a small order. In some cases, one producer loses an order because another can make delivery two or three days sooner. Aside from the Ford business, demand for sheets and strip steel continues slow. Efforts are being made by a few consumers in the automotive field to make commitments for extended deliveries. Some inquiry has come out for alloy steel bars for the third quarter and last half, and a large fabricator of automotive parts has attempted to secure quotations on hot-rolled strip for deliveries extending through the first quarter of next year. Producers, however, are declining to quote beyond the current quarter. Prices are firm on all steel products.

Pig Iron

Sales are being maintained at the recent limited volume. Orders placed during the week included 500 tons purchased by a Columbus, Ohio, foundry. Small-lot purchases are the rule. Foundries are buying only for the work they have on hand and some have made three small-lot purchases in three successive weeks. Shipments show little change. Prices are steady at $15.50, Cleveland, for foundry and malleable iron for local delivery. For outside shipment the maximum price is $15, which is being shaded for competitive points.

Iron Ore

Consumption of Lake Superior ore again declined in April, having totaled 1,039,799 tons, a decrease of 216,105 tons from March. In April, last year, 2,825,647 tons was consumed. Stocks at furnaces and Lake Erie docks on May 1 amounted to 33,478,882 tons, against 28,722,326 tons on the same day a year ago. There were 55 furnaces in blast using Lake ore May 1, a decrease of two for the month.

Bars, Plates and Shapes

Merchant bars have become somewhat more active. While the business is coming from diversified sources, orders from the automotive field predominate. Some good business in Bessemer bars has come from bolt and nut makers for automobile bolts. Demand for shapes and plates continues light. Little new inquiry for fabricated work is coming out. Prices are firm at 1.65c., Cleveland, for bars and 1.60c., Pittsburgh, for plates and shapes.

Semi-Finished Steel

An advance of $2 a ton for billets and slabs as well as for sheet bars to $28, Cleveland and Youngstown, is expected to be announced for the third quarter. While the local producer has not named prices for that delivery, it probably will adopt the prices quoted by other mills.

Sheets

A few moderate-sized lots were placed during the week by the Ford Motor Co. and some of the other automobile manufacturers and a local mill has been benefited by receiving a share of this business, enabling it to operate better this week than last. Demand in this territory continues very slow. While quite a few orders are being placed they are all for small lots. Prices are well maintained.

Strip Steel

The recent improvement in specifications for hot-rolled strip from some of the parts making subsidiaries of automobile manufacturers is being maintained, and some new business in rather small lots came from the motor car industry during the week. Demand in this territory is very light. Prices are firm at 1.40c. and 1.50c., Pittsburgh, for wide and narrow hot-rolled strip respectively and 2c., Cleveland, for cold-rolled material.

Cold-Finished Steel

Radical changes in quantity extras and some revision in size and other extras are made in a new extra card for cold-finished steel bars and shafting that become effective May 16. A new base price of 1.70c., Pittsburgh, Cleveland, Chicago and Buffalo, has been named as compared with the 1.90c. price, which has prevailed quite generally recently. However, the new base applies to lots of 10,000 lb. and more of one size and grade for shipment at one time to one destination. Under the old card, lots of 4000 lb. and over carried no extra. Under the new list 6000 to 10,000 lb. carries 10c. extra, 4000 to 6000 lb. a 20c. extra and 2000 to 4000 lb. a 40c. extra. The extra on screw stock has been increased $1 a ton to $3. Some prices are higher and some are lower under the new card. Consumers having contracts will be allowed to specify for the remainder of the current quarter at the lower prices on items that have been reduced. Extras for accuracy have been reduced. Standard manufacturing tolerances for bars and shafting are identical.

Scrap

The market is weak. With no consumer demand, the only outlet for blast furnace grades is for yard stocks and these grades have declined $1.25 a ton, being offered at as low prices as machine shop turnings. Very little scrap is being taken by consumers.

Buffalo Steel Output Higher This Week

BUFFALO, May 16.—Pig iron inquiries and orders are confined to small lots, with the exception of one for 1000 tons of foundry from a Massachusetts melter. It is not certain whether this is a possible order or merely a tentative inquiry for information. Hanna Furnace Corpn. has withdrawn its silvery furnace from blast.

Steel

The Republic Steel Corpn. resumed operation Saturday with three open-hearths to be continued this week. Bethlehem Steel Corpn. is operating nine open-hearths and Seneca Iron & Steel Corpn. is operating at about 25 per cent. Sheet business shows a slightly increased volume, but no heavy tonnage.

Scrap

A sale of short mixed borings and turnings is reported at $5 to $5.50. There are still some open orders for this material placed some time ago at $6.25 to $6.50. Another small tonnage of this material has been sold at $5.50.

Gray Iron Institute, Inc., is conducting a series of conferences at its various chapters for discussion of comparative cost reports for the first quarter of 1932 and to plan a program of cost activity for the next quarter.

New York State Declines to Rule Out Foreign Steel

Attorney General Gives Opinion That Departments Have No Authority to Specify Domestic Materials

NEW YORK, May 17.—The domestic steel industry, particularly the concrete reinforcing branch, which has been especially aggressive in urging use of domestic steel exclusively on public work, has received a setback in New York State, whose attorney general has ruled that "special preferences in materials cannot be inserted by departments without legislation granting such authority." THE IRON AGE is informed by Henry Epstein, First Assistant Attorney General, that no such legislative authority exists in New York. The steel industry has recently won victories in New Jersey and Maryland, where foreign steel is barred from use in public work, and believed that similar results had been achieved in New York State, some departments having given preference to domestic materials. The steel people will pursue the matter further in the hope of obtaining a favorable ruling or legislative authority.

Business generally in steel products in the New York district has barely held its own this month, in some instances having declined. At least two large structural steel projects, and possibly some smaller ones, have been held up pending settlement of the building trades strike in New York. Bids were opened in Washington today (Tuesday) on the foundations for the Federal Court Building, New York, for which about 3000 tons of large diameter pipe for piling will be required. A tentative inquiry is in the market for about 3500 tons of 14-in. pipe for a gas line in northwestern New York State.

Aside from the new price set-up for cold-finished steel bars, which is explained in detail elsewhere in this issue, there are no new developments in the finished steel price situation. However, the announced advance of $2 a ton on all semi-finished steel for the third quarter is regarded here as a further effort to strengthen the finished steel price situation. Prices are holding remarkably well, and there is apparently a firm intention to maintain them.

Pig Iron

The market is extremely dull. Current inquiries call for inconsequential amounts, and sales are practically all restricted to single carloads. For the third consecutive week bookings in the district totaled only 1500 tons. Although a few consumers have accelerated operations recently, activity on the whole thus far in May has barely kept pace with the low operating rate which prevailed in April. With melters covering only for bare needs, barge deliveries of iron are infrequent, and as a consequence no shipments from Buffalo on the State canal have been reported since opening of navigation. Southern iron, at $10, Birmingham, has been practically shut out of this district.

Scrap

No. 1 heavy melting steel is being purchased at $4.50 for barge shipment. Weakness in other grades persists, and the list is nominally lower.

Cincinnati Pig Iron Sales in Low Volume

CINCINNATI, May 17.—The low melt continues to be reflected in a small demand for pig iron. Current business is less than 600 tons a week, all in carload lots. Inquiry is lacking. Foundries are operating a few heats weekly, but the immediate outlook is uncertain.

Steel

A slight dip in sheet demand the past week was reported when refrigerator manufacturers curtailed specifications. Except for orders from two manufacturers of low-priced cars, the automotive demand is dull. Rolling schedules are about 30 per cent of capacity.

Scrap

The Louisville & Nashville Railroad is offering its first list since January. Railroad scrap sold on the past week's lists brought low prices and indicated present schedules are nominal. Local business is small and at buyers' prices.

Cast Iron Pipe

Latham's Corners, N. Y., has awarded 59,000 ft. of 6-, 8- and 10-in. to R. D. Wood & Co.

Revere, Mass., has closed bids on 10,000 ft., sizes not specified. Warren Foundry & Pipe Corpn. was low bidder on spun pipe, and United States Pipe & Foundry Co. was low on pit cast.

State of New York will take bids soon on 400 tons of various sizes for water and sewer projects.

State Reformatory for Women, Bedford Hills, N. Y., will open bids June 7 on 125 tons of small sizes.

Brooklyn is taking bids on 200 tons for sewerage and pumping station.

Bloomfield, N. J., has opened bids on 100 tons of 6- and 8-in.

Chicago will open bids on approximately 1000 tons about May 25.

Neenah, Wis., placed 100 tons of 4- to 8-in. class C with J. B. Clow & Sons Co.

Madison, Wis., placed 1820 lin. ft. of 14-in. class C with R. D. Wood & Co.

Oakland, Cal., will open bids May 27 for 1000 tons of 4-, 6- and 10-in. for East Bay Municipal Utility District.

Tacoma, Wash., awarded 80 tons of 12-in. to R. D. Wood & Co.

Colfax, Wash., awarded 128 tons of 6- and 8-in. special short length, with bolted joints, to Central Foundry Co.

Chehalis, Wash., awarded 75 tons of 4- and 6-in. to Pacific States Cast Iron Pipe Co.

Glendale will open bids May 26 on 359 tons of 24-in. class C.

Reinforcing Steel

Awards 2100 Tons—New Projects 3460 Tons

AWARDS

Thomaston, Conn., 100 tons, State bridge, to Truscon Steel Co.

New York, 215 tons, two sections of Grand Central Parkway; 115 tons to Truscon Steel Co., 100 tons to Fireproof Products Co.

Easton, Pa., 500 tons, reservoir, to Jones & Laughlin Steel Corpn.

Hackensack, N. J., 413 tons, Sears, Roebuck & Co. building, to Truscon Steel Co.

Akron, Ohio, 400 tons, Quaker Oats Co., to West Virginia Rolling Mill Co.

Rockford, Ill., 250 tons, post office, to Joseph T. Ryerson & Son, Inc.

Panama Canal Zone, 240 tons, to United States Steel Products Co.

NEW REINFORCING BAR PROJECTS

Dobbs Ferry, N. Y., 119 tons, high school.

Union City, N. J., 255 tons, Sears, Roebuck & Co. building.

Washington, 2200 tons, extensible building, Department of Agriculture; Aronberg-Fried Co., Inc., New York, low bidder on general contract.

Tombstone, Ariz., 124 tons, State highway structure; bids close May 20.

Contra Costa County, Cal., 120 tons, State highway structures, bids close June 1.

Los Angeles, 1000 tons, *Times* newspaper building.

San Francisco, 120 tons, dock extension at Fort Mason.

Van Nuys, Cal., 100 tons, city hall.

New York, 269 tons, Federal court house foundation; George J. Atwell Foundation Co., New York, low bidder on general contract.

Chicago, 225 tons, Marine Hospital.

State of Indiana, 1000 tons, paving.

Des Moines, Iowa, 125 tons, Veterans' building.

Detroit Scrap Market Turns Weaker

DETROIT, May 17.—With consumer demand for scrap almost at a standstill and an increasing amount of material coming onto the market as a result of higher motor car production, prices again have declined, heavy melting steel having slipped off another 25c. a ton. Blast furnace items are particularly weak.

Railroad Equipment

Interborough Rapid Transit Co. has ordered 50 steel subway cars from American Car & Foundry Co.

General Chemical Co. has ordered two 7000-gal. tank cars from American Car & Foundry Co.

Fabricated Structural Steel

Awards Extremely Light—New Projects Also Lower

WITH lettings of only 3100 tons, fabricated steel business the past week was one of the dullest for a corresponding period on record. The largest booking was 520 tons for the Shushan airport at New Orleans. Plate awards total 3240 tons. New structural projects will require 4500 tons. The bulk of activity is in the East and the largest inquiry, 1000 tons, is for bridges in the State of New York. Awards follow:

NORTH ATLANTIC STATES

Boston, 250 tons, Arlington Street bridge, to Boston Bridge Works, Inc.

Niagara Falls, N. Y., 120 tons, Niagara University stadium, to Dobbie Foundry & Machine Co.

Holland, N. Y., 130 tons, school, to Ernst Iron Works, Buffalo.

Jersey City, N. J., 160 tons, crane tower, to American Bridge Co.

Easton, Pa., 320 tons, pumping station, to Lehigh Structural Steel Co.

Philadelphia, 218 tons, building at 1216 Chestnut Street, to Morris Wheeler & Co.

SOUTH AND SOUTHWEST

State of Virginia, 425 tons, highway bridges, divided between Roanoke Bridge & Iron Co. and Virginia Bridge & Iron Co.

New Orleans, 520 tons, Shushan airport, to Jones & Laughlin Steel Corpn.

Pitcher, Okla., 100 tons, smelter jigs, to Ozark Engineering Co.

CENTRAL STATES

State of Michigan, 170 tons, highway bridge, to Lackawanna Steel Construction Corpn.

Mankato, Minn., 150 tons, post office, to Minneapolis-Moline Power & Implement Co.

Fort Edwards, Wis., 100 tons, bridge, to Wisconsin Bridge Co.

Humestown, Iowa, 200 tons, bridge, to McClintic-Marshall Corpn.

Adair County, Iowa, 100 tons, highway spans, to Pittsburgh-Des Moines Steel Co.

NEW STRUCTURAL STEEL PROJECTS

NORTH ATLANTIC STATES

Providence, R. I., 400 tons, bridge.

Waterford, Conn., 300 tons, hospital.

Hoboken, N. J., 250 tons, paper manufacturing building.

State of New York, 1000 tons, highway projects.

Rockview, Pa., 300 tons, boiler house for State hospital.

Buena Vista, Md., 500 tons, children's sanatorium.

Washington, 10,000 tons, Postoffice Department building; opening of bids deferred from May 23 to May 24.

Washington, 8500 tons, Interstate Commerce Commission, Department of Labor auditorium building; bids opened May 17.

Washington, 10,000 tons, Department of Justice building; Great Lakes Construction Co., Chicago, low bidder on general contract.

Washington, 8000 tons, extensible building, Department of Agriculture; Aronberg-Fried Co., Inc., New York, low bidder.

THE SOUTH

Bardstown, Ky., 300 tons, highway bridge.

CENTRAL STATES

Manistee, Mich., 400 tons, piling for highway bridge; this is in addition to 850 tons of structural steel previously reported.

Akron, Ohio, 100 tons, grain elevator for Quaker Oats Co.

Sioux City, Iowa, 700 tons, post office.

Jefferson City, Mo., 300 tons, post office.

Milwaukee Road, 250 tons, overhead crossing.

Waukegan, Ill., 200 tons, post office.

WESTERN STATES

Sacramento, 900 tons, H Street County bridge over American River, Pacific Bridge Co., general contractor.

Snohomish County, Wash., 800 tons, Silvana state highway bridge over Stillaguamish River; D. Nygren, general contractor.

State of Montana, 213 tons, highway bridges; McLaughlin Construction Co., general contractor.

FABRICATED PLATE

AWARDS

Louisville, Ky., 2200 tons, 12 barges for American Barge Line, to American Bridge Co.

Pittsburgh, 120 tons, derrick hull for export to Colombia, to American Bridge Co.

Los Angeles, 820 tons, Southern Counties Gas Co. gas holder, to Chicago Bridge & Iron Works.

Stockton, Cal., 100 tons, tank and tower for harbor project, to Chicago Bridge & Iron Co.

German Steel Situation Much Improved by Russian Orders

Some Mills Working Full Time—Additional Order for 50,000 Tons —Belgium May Exchange Steel for Russian Manganese Ore

LONDON, ENGLAND, May 17 (*By Cable*).—The British markets are under holiday influences. Most tin plate works are remaining idle all week.

United Kingdom exports of pig iron in April totaled 21,700 tons, including 9200 tons to the United States. Total exports of all kinds of iron and steel were 108,000 tons.

Barrow Hematite Steel Co., Ltd., is starting operation of two blast furnaces and three rail mills.

The English Steel Corpn. has dismantled its River Don works preliminary to reconstruction on a larger scale.

British iron and steel delegates to the Empire conference to be held at Ottawa, Ont., on June 23, include A. J. Grant, managing director of Thomas Firth & Sons, Ltd., and John Brown & Co., Ltd., and president of the National Federation of Iron and Steel Manufacturers; Sir William Larke, director of the National Federation; Julian Piggott, manager of the British Steel Export Association; Fred Smith, of British Ropes, Ltd.; George Smith, of the Firth company, and Geoffrey Summers, of John Summers & Sons, Ltd. The conference will work toward reciprocal trade between Great Britain and the Dominion.

French, Belgian and German steel masters have held a conference in Brussels to discuss the difficulties arising from Government restrictions on payments and foreign exchange in various European countries. It is proposed to further curtail deliveries to such countries.

The German position has been improved by recent Russian orders and some mills are working full time. The German Steel Works Association has received a further Russian order for 50,000 tons of rolled steel for June delivery.

Fresh negotiations have been held by German, French, Luxemburg and Belgian hoop makers with a view to reorganizing the Continental Hoop Iron Syndicate.

It is reported that Belgian works may supply Russia with rolled steel in exchange for manganese ore.

The Austrian Alpine Montangesellschaft has blown out the only blast furnace that has recently been operating in Austria. The Polish Konigshütte blast furnaces are working at half capacity while the Konigshütte rolling mills may be shut down today unless Government orders are secured.

British Prices, f.o.b. United Kingdom Ports

Per Gross Ton

Ferromanganese, export	£9	0s.			
Billets, open-hearth	5	7	6d to £5	12s.	6d
Black sheets, Japanese specifications	9	12	6		
Tin plate, per base box	14	9	to 15	0	
Steel bars, open-hearth	7	17½	to 8	7½	
Beams, open-hearth	7	7½	to 7	17½	
Channels, open-hearth	7	12½	to 8	2½	
Angles, open-hearth	7	7½	to 7	17½	
Black sheets, No. 24 gage	8	0	to 8	10	
Galvanized sheets, No. 24 gage	9	5	to 9	7	6

Continental Prices, f.o.b. Continental Ports

Per Metric Ton, Gold £ at $4.86

Billets, Thomas	£2	1s.
Wire rods, No. 5 B.W.G.	4	10
Black sheets, No. 31 gage, Japanese	11	5
Steel bars, merchant	2	4
Beams, Thomas	2	3
Angles, Thomas, 4-in. and larger	2	3
Angles, small	2	5
Hoops and strip steel over 6-in. base	3	5
Wire, plain, No. 8	5	7½
Wire, barbed, 4-pt., No. 10 B.W.G.	8	15

Copper and Zinc at New Low Prices; Lead Firm; Tin in Small Demand

NEW YORK, May 17.—The price of electrolytic copper receded to a new low level today, when custom smelters offered metal at 5.37½c., delivered Connecticut Valley. Primary producers have not yet indicated a disposition to lower their quotation, which is still maintained at 6c., delivered. Notwithstanding the low-priced offerings of custom smelters, little new buying of copper is in prospect, as most of the important consumers are well covered for their requirements. Following the posting of a special export price of 5.62½c., c.i.f. usual European ports, export bookings showed a sudden spurt on May 13, when 1200 tons was sold, bringing the total for the first half of May to 3800 tons. Lake copper is practically dormant and nominally unchanged at 5.75c., delivered.

Lead

Moderate buying of lead continues from day to day, with the total volume in the past week smaller than in the preceding week. Producers are much encouraged by April lead statistics, which disclosed that production in that month, totaling 26,370 tons, was practically on a parity with shipments, which aggregated 26,081 tons. Visible stocks of lead increased only 200 tons in April. A further improvement in the industry's statistical position is expected after additional curtailment is effected by leading producers on June 1. Prices are very firm at 2.90c. a lb., St. Louis, and 3c., New York.

Tin

Demand for tin has been apathetic throughout the past week. With little pressure being exerted by sellers to move metal, the New York price of tin has fluctuated within a narrow range. The London market today was £119 a ton for spot standard, £121 2s. 6d. for future standard and £123 3s. 5d. for spot Straits. Today's Singapore quotation was £123 17s. 6d. Warehouse stocks in the United Kingdom increased 215 tons last week to a total of 33,446 tons. Shipments from the East in the first half of May aggregated 2311 tons.

Zinc

A steadily declining market, in which a record low price of 2.30c., East St. Louis, and 2.67c., New York, was reached, has failed to arouse consumer demand. The persistent weakness in price is largely attributable to forced liquidation of stocks by several small producers. Leading producers, however, are not forcing sales at present quotations and are disposed only to serve regular customers at the market.

Antimony

Demand for either spot or futures is nonexistent. Prompt metal is quotable at 5.30c., duty paid, while futures are posted at 2.95c., c.i.f. New York. Exports of Chinese antimony to the United States in April amounted only to 25 tons. The total in the first four months of this year was 525 tons.

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The Week's Prices. Cents Per Pound for Early Delivery

	May 11	May 12	May 13	May 14	May 16	May 17
Lake copper, New York	5.75	5.75	5.75	5.75	5.75	5.75
Electrolytic copper, N. Y.*	5.37½	5.25	5.25	5.25	5.25	5.12½
Straits tin, spot, N. Y.	21.25	20.62½	20.37½	....	20.45	20.37½
Zinc, East St. Louis	2.45	2.37½	2.35	2.35	2.30	2.30
Zinc, New York	2.82	2.74½	2.72	2.72	2.67	2.67
Lead, St. Louis	2.90	2.90	2.90	2.90	2.90	2.90
Lead, New York	3.00	3.00	3.00	3.00	3.00	3.00

*Refinery quotation; price ¼c. higher delivered in the Connecticut Valley.

Aluminum, 98 to 99 per cent pure, 22.90c. a lb., delivered.
Nickel, electrolytic cathode, 35c. a lb., delivered; shot and ingot, 36c. a lb., delivered.
Antimony, 5.30c. a lb., New York.
Brass ingots, 85-5-5-5, 6.00c. a lb., New York and Philadelphia.

From New York Warehouse

Delivered Prices, Base per Lb.

Tin, Straits pig	22.00c. to 23.00c.
Tin, bar	24.00c. to 26.00c.
Copper, Lake	8.00c. to 9.00c.
Copper, electrolytic	7.75c. to 8.75c.
Copper, casting	7.50c. to 8.50c.
*Copper sheets, hot-rolled	15.37½c.
*High brass sheets	12.50c.
*Seamless brass tubes	15.75c.
*Seamless copper tubes	14.87½c.
*Brass rods	10.25c.
*Brazed brass tubes	21.62½c.
Zinc, slab	4.00c. to 4.50c.
Zinc sheets (No. 9), casks	9.25c. to 9.50c.
Lead, American pig	4.00c. to 4.50c.
Lead, bar	5.75c. to 6.75c.
Lead sheets	7.50c.
Antimony, Asiatic	8.50c. to 9.50c.
Alum., virgin, 99 per cent plus	23.30c.
Alum. No. 1 for remelting, 98 to 99 per cent.	16.00c. to 17.00c.
Solder, ½ and ½	14.75c. to 15.75c.

*These prices are also for delivery from Chicago and Cleveland warehouses.

Metals from Cleveland Warehouse

Delivered Prices per Lb.

Tin, Straits pig	24.00c.
Tin, bar	26.00c.
Copper, Lake	6.75c. to 7.00c.
Copper, electrolytic	6.75c. to 7.00c.
Copper, Casting	6.50c. to 6.75c.
Zinc, slab	4.25c. to 4.50c.
Lead, American pig	3.75c. to 4.00c.
Lead, bar	7.25c.
Antimony, Asiatic	10.00c.
Babbitt metal, medium grade	14.50c.
Babbitt metal, high grade	28.00c.
Solder, ½ and ½	16.00c.

Old Metals, Per Lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators, and selling prices are those charged to consumers after the metal has been prepared for their uses. (All prices are nominal.)

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	4.25c.	4.75c.
Copper, hvy. and wire	4.00c.	4.625c.
Copper, light and bottoms	3.25c.	3.875c.
Brass, heavy	2.00c.	2.50c.
Brass, light	1.50c.	2.25c.
Hvy. machine composition	3.00c.	3.50c.
No. 1 yel. brass turnings	2.25c.	2.75c.
No. 1 red brass or compos. turnings	2.75c.	3.25c.
Lead, heavy	2.00c.	2.50c.
Zinc	1.00c.	1.50c.
Cast aluminum	3.50c.	4.50c.
Sheet aluminum	7.75c.	9.00c.

Pipe Lines

Fulton Petroleum Corpn., Grand Junction, Colo., care of Helen C. Tomlinson, city clerk, plans installation of natural gas pipe line in city and vicinity. Application for franchise will be voted on May 31.

Elmira Water, Light & Railroad Co., Elmira, N. Y., plans installation of gas pipe line system at Catharine, N. Y.

Department of Public Works, Bureau of Water, City Hall Annex, Philadelphia, asks bids until June 2 for 48-in. steel water pipe. (Contract 1038).

Empire Southern Gas Co., Alexandria, La., plans installation of 8-in. natural gas pipe line at Brady, Tex.

Irak Petroleum Corpn. has placed orders with American mills for 8400 tons of 10¾-in. line pipe. National Tube Co. negotiated the business, which will be shared with one or two other manufacturers.

Santa Barbara, Cal., is considering a proposal for a bond issue for $300,000 to $400,000 to replace 7000 ft. of wooden pipe line and construct two reservoirs of one and two million gallons capacity.

Cashmere, Wash., is considering a proposal for a mountain water system to replace present pumping and purifying method. Plan involves 30 miles of 22- and 24-in. pipe, crossing Columbia River over a bridge at Wenatchee and supplying communities en route. Cost about $664,800.

Bieber, Cal., has voted bonds for $10,000 for water system improvements for mains and fire hydrants.

Corrigan, McKinney and Newton May Merge

Negotiations for the merger of the Newton Steel Co. with the Corrigan, McKinney Steel Co., which were undertaken several months ago and later discontinued, have been resumed and various details of the consolidation are now being worked out. Corrigan, McKinney for a long time has been furnishing sheet bars to the Newton company, which has sheet mills at Newton Falls, Ohio, and Monroe, Mich.

Prices of Finished and Semi-Finished Steel, Coke, Coal, Cast Iron Pipe

BARS, PLATES, SHAPES

Iron and Steel Bars

Soft Steel

	Base per Lb.
F.o.b. Pittsburgh mill	1.60c.
F.o.b. Chicago	1.70c
Del'd Philadelphia	1.91c.
Del'd New York	1.95c.
Del'd Detroit	1.80c.
F.o.b. Cleveland	1.65c.
F.o.b. Lackawanna	1.70c.
F.o.b. Birmingham	1.75c.
C.i.f. Pacific ports	2.00c.

Billet Steel Reinforcing

F.o.b. P'gh mills, 40, 50, 60-ft.	1.60c.
F.o.b. Birmingham, mill lengths	1.75c.
F.o.b. Cleveland	1.50c.

Rail Steel

F.o.b. mills, each of Chicago dist.	1.30c. to 1.35c.
F.o.b. Chicago Heights mills	1.50c. to 1.60c.
Del'd Philadelphia	1.49c. to 1.59c.

Iron

Common iron, f.o.b. Chicago	1.65c.
Refined iron, f.o.b. P'gh mills	2.75c.
Common iron, del'd Philadelphia	2.11c.
Common iron, del'd New York	2.15c.

Tank Plates

	Base per Lb.
F.o.b. Pittsburgh mill	1.60c.
F.o.b. Chicago	1.70c.
F.o.b. Birmingham	1.75c.
Del'd Cleveland	1.8035c.
Del'd Philadelphia	1.7935c.
F.o.b. Coatesville	1.70c.
F.o.b. Sparrows Point	1.70c.
F.o.b. Lackawanna	1.70c.
Del'd New York	1.898c.
C.i.f. Pacific ports	1.90c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh mill	1.60c.
F.o.b. Birmingham	1.75c.
F.o.b. Lackawanna	1.70c.
F.o.b. Bethlehem	1.70c.
Del'd Cleveland	1.8035c.
Del'd Philadelphia	1.6495c.
Del'd New York	1.86775c.
C.i.f. Pacific ports (standard)	2.00c.
C.i.f. Pacific ports (wide flange)	2.10c.

Steel Sheet Piling

	Base per Lb.
F.o.b. Pittsburgh	1.90c.
F.o.b. Chicago mill	2.05c.
F.o.b. Buffalo	2.00c.

Alloy Steel Bars

(F.o.b. maker's mill)

Alloy Quantity Bar Base, 2.65c. per Lb.

S.A.E. Series Numbers	Alloy Differential per 100 Lb.
2000 (½% Nickel)	$0.25
2100 (1½% Nickel)	0.55
2300 (3½% Nickel)	1.50
2500 (5% Nickel)	2.25
3100 Nickel Chromium	0.55
3200 Nickel Chromium	1.35
3300 Nickel Chromium	3.80
3100 Nickel Chromium	3.20
4100 Chromium Molybdenum (0.16 to 0.25 Molybdenum)	0.50
4100 Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600 Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.50 to 2.00 Nickel)	1.05
5100 Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100 Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100 Chromium Spring Steel	0.20
6100 Chromium Vanadium Bar	1.20
6100 Chromium Vanadium Spring Steel	0.95
9250 Silicon Manganese Spring Steel (flats)	0.25
Rounds and squares	0.50
Chromium Nickel Vanadium	1.50
Carbon Vanadium	0.95

Above prices are for hot-rolled steel bars, forging quality. The differentials for cold-drawn bars is ¾c. a lb. higher, with standard classification for cold-finished alloy steel bars applying. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis.

Billets under 4 x 4 in. carry the steel bar base. Slabs with a section area of 16 in. or over carry the billet price. Slabs with sectional area of less than 16 in. or less than 2½ in. thick, regardless of sectional area, take the bar price.

Cold Finished Bars*

	Base per Lb.
Bars, f.o.b. Pittsburgh mill	1.70c.
Bars, f.o.b. Chicago	1.70c.
Bars, Cleveland	1.70c.
Bars, Buffalo	1.70c.
Shafting, ground, f.o.b. mill	†2.05c. to 3.60c.

*In quantities of 10,000 lb. or more.
†According to size.

SHEETS, STRIP, TIN PLATE, TERNE PLATE

Sheets

Hot-rolled

	Base per Lb.
No. 10 f.o.b. Pittsburgh	1.55c.
No. 10 f.o.b. Chicago mill	1.65c.
No. 10 del'd Philadelphia	1.86c.
No. 10, f.o.b. Birmingham	1.70c.
No. 10, c.i.f. Pacific Coast ports	2.32½c.

Hot-Rolled and Annealed

No. 10, Pittsburgh	1.70c.
No. 10, Chicago mills	1.80c.
No. 10, Birmingham	1.85c.

Hot-Rolled Annealed

No. 24, f.o.b. Pittsburgh	2.20c.
No. 24, f.o.b. Chicago mills	2.30c.
No. 24, del'd Philadelphia	2.46c. to 2.51c.
No. 24, f.o.b. Birmingham	2.35c. to 2.50c.
No. 24, c.i.f. Pacific Coast ports	2.85c.

Heavy Cold-Rolled

No. 10 gage, f.o.b. Pittsburgh	2.25c.
No. 10 gage, f.o.b. Chicago mills	2.35c.
No. 10 gage, del'd Philadelphia	2.46c.

Light Cold-Rolled

No. 20 gage, f.o.b. Pittsburgh	2.75c.
No. 20 gage, f.o.b. Chicago mills	2.85c.
No. 20 gage, del'd Philadelphia	3.06c.

Automobile Body Sheets

No. 20, f.o.b. Pittsburgh	2.90c.

Steel Furniture Sheets

No. 10, f.o.b. Pittsburgh	2.65c.
No. 20, f.o.b. Pittsburgh	3.15c.

(Prices on furniture stock include stretcher leveling but not resquaring.)

Galvanized Sheets

No. 24, f.o.b. Pittsburgh	2.85c.
No. 24, f.o.b. Chicago mills	2.95c.
No. 24, del'd Philadelphia	3.16c.
No. 24, f.o.b. Birmingham	3.00c.
No. 24, c.i.f. Pacific Coast ports	3.50c.

Long Ternes

No. 24, unassorted, 8-lb. coating, f.o.b. P'gh	2.80c. to 3.00c.

Vitreous Enameling Stock

No. 10, f.o.b. Pittsburgh	2.60c.
No. 20, f.o.b. Pittsburgh	3.10c.

Tin Mill Black Plate

No. 28 f.o.b. Pittsburgh	2.40c.
No. 28 Chicago mill	2.50c.

Tin Plate

	Base per Box
Standard cokes, f.o.b. P'gh district mills	$4.75
Standard cokes, f.o.b. Gary	4.85

Terne Plate

(*F.o.b. Morgantown or Pittsburgh*)
(Per Package, 20 x 28 in.)

8-lb. coating I.C.	$9.50
15-lb. coating I.C.	12.00
20-lb. coating I.C.	13.00
25-lb. coating I.C.	14.10
30-lb. coating I.C.	14.90
40-lb. coating I.C.	16.70

Hot-rolled Hoops, Bands and Strips

	Base per Lb.
6 in. and narrower, Pittsburgh	1.50c. to 1.60c.
Wider than 6 in., P'gh	1.40c. to 1.50c.
6 in. and narrower, Chicago	1.60c. to 1.70c.
Wider than 6 in., Chicago	1.50c. to 1.60c.
Cooperage stock, P'gh	1.60c. to 1.70c.
Cooperage stock, Chicago	1.70c. to 1.80c.

Cold-Rolled Strips

F.o.b. Pittsburgh	2.00c.
F.o.b. Cleveland	2.00c.
Del'd Chicago	2.30c.
F.o.b. Worcester	2.20c.
Fender stock, No. 20 gage, Pittsburgh or Cleveland	2.90c. to 3.00c.

WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh and Cleveland)

(After Dec. 31, extras of 10c. a 100 lb. on mixed and joint carloads, 25c. on pool carloads and 40c. on less than carloads will be applied on all merchant wire products.)

To Manufacturing Trade

	Base per Keg
Bright wire	2.20c.
Spring wire	3.20c.

To Jobbing Trade

	Base per Keg
Standard wire nails	$1.95
Smooth coated nails	1.95
Galvanized nails	3.95

	Base per Lb.
Smooth annealed wire	2.35c.
Smooth galvanized wire	2.80c.
Polished staples	2.50c.
Galvanized staples	2.75c.
Barbed wire, galvanized	2.60c.
Woven wire fence No. 9 gage, per net ton	$55.00
Woven wire fence, No. 12½ gage and lighter, per net ton	60.00

Chicago and Anderson, Ind., mill prices are $1 a ton over Pittsburgh base; Duluth, Minn., and Worcester, Mass., mill $2 a ton over Pittsburgh, and Birmingham mill $3 a ton over Pittsburgh.

STEEL PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
⅛	47	21½	¼ and ⅜	+9	+34
¼ to ⅜	53	27½	½	25	7
½	58	44½	¾	30	13
¾	62	50½	1 and 1¼	32	17
1 to 3	64	52½	1½ and 2	37	20

Lap Weld

2	57	45½	2	25	11
2½ to 6	61	49½	2½ to 3½	30	15
7 and 8	58	45½	4 to 6	32	19
9 and 10	56	43½	7 and 8	31	18
11 and 12	55	42½	9 to 12	28	13

Butt Weld, extra strong, plain ends

⅛	43	26½	¼ and ⅜	+11	+46
¼ to ⅜	49	32½	½	25	9
½	55	44½	¾	30	14
¾	60	49½	1 to 2	36	20
1 to 1½	62	51½			
2 to 3	63	52½			

Lap Weld, extra strong, plain ends

2	55	44½	2	31	15
2½ to 4	59	48½	2½ to 4	36	22
4½ to 6	58	47½	4½ to 6	35	21
7 to 8	54	41½	7 and 8	33	19
9 and 10	47	34½	9 to 12	23	10
11 and 12	46	33½			

On carloads the above discounts on steel pipe are increased on black by one point, with supplementary discounts of 5 and 2½%, and on galvanized by 1½ points with supplementary discounts of 5 and 2½%. On iron pipe, both black and galvanized, the above discounts are increased to jobbers by one point with supplementary discounts of 5 and 2½%.

Note—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel		Charcoal Iron	
2 in. and 2¼ in.	38	1½ in.	1
2½ in.—2¾ in.	46	1¾ in.	8
3 in.	52	2 in.—2¼ in.	13
3¼ in.—3¾ in.	54	2½ in.—2¾ in.	16
4 in.	57	3 in.	17
4½ in. to 6 in.	46	3¼ in. to 3½ in.	18
		4 in.	20
		4½ in.	21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

Standard Commercial Seamless Boiler Tubes

Cold-Drawn

1 in.	61	3 in.	46
1¼ to 1½ in.	53	3¼ to 3½ in.	48
1¾ in.	37	4 in.	51
2 to 2¼ in.	32	4½, 5 and 6 in.	40
2½ to 2¾ in.	40		

Hot Rolled

2 and 2¼ in.	38	3¼ to 3½ in.	54
2½ and 2¾ in.	46	4 in.	57
3 in.	52	4½, 5 and 6 in.	46

Beyond the above base discounts a preferential discount of 5 per cent is allowed on carloads lots. On less than carloads to 10,000 lb., base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb., base discounts are reduced 6 points with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. in lighter than standard gages takes the mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

	Per Cent Off List
Carbon, 0.10% to 0.30% base (carloads)	55
Carbon, 0.30% to 40% base	50

Plus differential for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

RAILS AND TRACK SUPPLIES

Rails

	Per Gross Ton
Standard, f.o.b. mill	$43.00
Light (from billets), f.o.b. mill	34.00
Light (from rail steel), f.o.b. mill	32.00

Track Equipment

	Base per 100 Lb.
Spikes, 9/16-in. and larger	$2.60
Spikes, ½-in. and larger	2.60
Spikes, boat and barge	2.80
Tie plate, steel	1.85
Angle bars	2.75
Track bolts, to steam railroads	3.50
Track bolts, to jobbers, all sizes, per 100 count	.73 per cent off list

BOLTS, NUTS, RIVETS AND SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
† Machine bolts	75
† Carriage bolts	75
Lag bolts	75
Plow bolts, Nos. 1, 2, 3 and 7 heads	75
Hot-pressed nuts, blank or tapped, square	75
Hot-pressed nuts, blank or tapped, hexagons	75
C.p.c. and t. square or hex. nuts, blank or tapped	75
Washers*	7.00c. to 6.75c. per lb. off list

*F.o.b. Chicago, New York and Pittsburgh.

†Bolts with rolled thread up to and including ⅜ in. x 6 in. take 10 per cent lower list prices.

Bolts and Nuts

	Per Cent Off List
Semi-finished hexagon nuts	75
Semi-finished hexagon castellated nuts, S.A.E.	75
Stove bolts in packages, P'gh, 77½, 25 and 10	
Stove bolts in packages, Ch'go, 77½, 25 and 10	
Stove bolts in pkgs., Cleveland, 77½, 25 and 10	
Stove bolts in bulk, P'gh	86
Stove bolts in bulk, Chicago	86
Stove bolts in bulk, Cleveland	86
Tire bolts	60 and 10

Discount of 75 per cent off on bolts and nuts applies on carload business with jobbers and large consumers.

Large Rivets

(½-in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland	$2.25
F.o.b. Chicago	70, 10 and 5

Small Rivets

(7/16-in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh	70, 10 and 5
F.o.b. Cleveland	70, 10 and 5
F.o.b. Chicago	70, 10 and 5

Cap and Set Screws

(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)

	Per Cent Off List
Milled cap screws	80, 10, 10 and 5
Milled standard set screws, case hardened	80 and 5
Milled headless set screws, cut thread	75 and 10
Unset hex. head cap screws, U.S.S.S. or S.A.E. ethread, 85 and 10 to 85, 10, 10 and 10	
Unset set screws	80, 10 and 5
Milled studs	70

SEMI-FINISHED STEEL

Billets and Blooms

	Per Gross Ton
Rerolling, 4-in. and under 10 in., Pittsburgh	$26.00 to $28.00
Rerolling, 4-in. and under 10-in., Youngstown	26.00 to 28.00
Rerolling, 4-in. and under 10 in., Cleveland	26.00 to 28.00
Rerolling, 4-in. and under 10-in., Chicago	29.00
Forging quality, Pittsburgh	33.00 to 34.00
Forging quality, Youngstown	33.00

Sheet Bars

(Open-Hearth or Bessemer)

	Per Gross Ton
Pittsburgh	$26.00 to $28.00
Youngstown	26.00 to 28.00
Cleveland	26.00 to 28.00

Slabs

(8 in. x 2 in. and under 10 in. x 10 in.)

	Per Gross Ton
Pittsburgh	$26.00 to $28.00
Youngstown	26.00 to 28.00
Cleveland	26.00 to 28.00

(*Turn to next page*)

Skelp

(F.o.b. Pittsburgh or Youngstown)

	Per Lb.
Grooved	1.60c.
Universal	1.60c.
Sheared	1.60c.

Wire Rods

(Common soft, base)

	Per Gross Ton
Pittsburgh	$37.00
Cleveland	37.00
Chicago	38.00

COKE, COAL AND FUEL OIL

Coke

	Per Net Ton
Furnace, f.o.b. Connellsville prompt	$2.25
Foundry, f.o.b. Connellsville prompt	$3.00 to 4.25
Foundry, by-product, Chicago ovens	7.50
Foundry, by-product, New England, delivered	10.00
Foundry, by-product, Newark or Jersey City, del'd	8.35 to 8.75
Foundry, by-product, Phila.	9.00
Foundry, by-product, Cleveland, delivered	7.82
Foundry, Birmingham	5.00
Foundry, by-products, St. Louis, f.o.b., ovens	8.00
Foundry, by-products, del'd St. Louis	9.00

Coal

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	$1.40 to $1.50
Mine run coking, coal, f.o.b. W. Pa.	1.50 to 1.60
Gas coal, ¾-in., f.o.b. Pa. mines	1.70 to 1.80
Mine run gas coal, f.o.b. Pa. mines	1.50 to 1.60
Steam slack, f.o.b. W. Pa. mines	0.50 to 0.65
Gas slack, f.o.b. W. Pa. mines	0.50 to 0.65

Fuel Oil

Per Gal. f.o.b. Bayonne, N. J.

No. 3 distillate	4.00c.
No. 4 industrial	3.50c.

Per Gal. f.o.b. Baltimore

No. 3 distillate	3.50c.
No. 4 industrial	3.25c.

Per Gal. del'd Chicago

No. 3 industrial fuel oil	2.75c.
No. 5 industrial fuel oil	2.60c.

Per Gal. f.o.b. Cleveland

No. 3 industrial fuel oil	4.62½c.
No. 4 distillate	3.87½c.

REFRACTORIES

Fire Clay Brick

	Per 1000 High-heat Duty Brick	f.o.b. Works Intermediate Duty Brick
Penn.	$38.00	$25.00 to $30.00
Maryland	38.00	25.00 to 30.00
New Jer.	$44.00 to 57.00	
Ohio	38.00	25.00 to 30.00
Kentucky	38.00	25.00 to 30.00
Missouri	35.00	30.00
Illinois	38.00	25.00 to 30.00
Ground fire clay, per ton	6.50	

Chrome Brick

	Per Net Ton
Standard size	$42.50

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$38.00
Chicago	47.00
Birmingham	50.00
Silica clay, per ton	8.0

Magnesite Brick

	Per Net Ton
Standard sizes, f.o.b. Baltimore and Chester, Pa.	$61.50
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	38.50
Domestic, f.o.b. Chewelah, Wash.	20.90

CAST IRON PIPE

Per Net Ton

6-in. and larger, del'd Chicago	$36.40 to $38.40
4-in., del'd Chicago	39.40 to 41.40
6-in. and larger, del'd New York	28.20
4-in., del'd New York	31.20
6-in. and larger, Birm'ham	$32.00 to 33.00
4-in., Birmingham	35.00 to 36.00

Class "A" and gas pipe, $3 extra.

Pig Iron, Ores, Ferroalloys

VALLEY

Per gross ton, f.o.b. Valley furnace:

Basic	$14.00
Bessemer	15.00
Gray forge	14.50
No. 2 foundry	14.50
No. 3 foundry	14.00
Malleable	15.00
Low phos., copper free	25.00

Freight rate to Pittsburgh or Cleveland district, $1.89.

PITTSBURGH

Per gross ton, f.o.b. Pittsburgh district furnace:

Basic	$14.50
No. 2 foundry	15.50
No. 3 foundry	15.00
Malleable	15.50
Bessemer	15.50

Freight rates to points in Pittsburgh district range from 69c. to $1.26.

CHICAGO

Per gross ton at Chicago furnace:

N'th'n No. 2 fdy.	$16.00
N'th'n No. 1 fdy.	16.50
Malleable, not over 2.25 sil.	16.00
High phosphorus	16.00
Lake Super. charcoal, sil. 1.50, by rail	23.17
Southern No. 2 fdy.	16.14
Low phos., sil. 1 to 2, copper free	27.50
Silvery, sil. 8 per cent	23.67
Bess. ferrosil'n, 15 per cent	28.92

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnaces, not including a switching charge.

ST. LOUIS

Per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25, f.o.b. Granite City, Ill.	$17.50
Malleable, f.o.b. Granite City	17.50
Northern No. 2 fdy., del'd St. Louis	$18.30 to 18.80
Southern No. 2 fdy. del'd	14.56
Northern malleable, del'd	18.30 to 18.80
Northern basic, deliv'd	18.30 to 18.80

Freight rates 83c. (average) Granite City to St. Louis; $2.30 from Chicago; $4.56 from Birmingham.

NEW YORK

Per gross ton, delivered New York district:

*Buffalo, No. 2, del'd east. N. J.	$17.91 to $18.41
East. Pa. No. 2 fdy.	15.52 to 15.77
East. Pa. No. 2X fdy.	16.02 to 16.27

Freight rates: $1.52 to $2.63 from eastern Pennsylvania.

*Prices delivered to New Jersey cities having rate of $3.41 a ton from Buffalo.

BUFFALO

Per gross ton, f.o.b. furnace:

No. 2 fdy.	$16.00
No. 2X fdy.	16.50
No. 1 fdy.	17.50
Malleable, sil. up to 2.25	16.50
Basic	15.50
Lake Superior charcoal, del'd	23.41

NEW ENGLAND

Per gross ton delivered to most New England points:

*Buffalo, sil. 1.75 to 2.25	$19.54 to $20.04
*Buffalo, sil. 2.25 to 2.75	$19.54 to $20.04
*Ala., sil. 1.75 to 2.25	19.74
*Ala., sil. 2.25 to 2.75	20.24
†Ala., sil. 1.75 to 2.25	15.88
†Ala., sil. 2.25 to 2.75	16.28

Freight rates: $5.04 all rail from Buffalo; $9.75 all rail from Alabama and $5.88 rail and water from Alabama to New England seaboard.

*All rail rate.

†Rail and water rate.

CINCINNATI

Per gross ton, delivered Cincinnati:

Ala. fdy., sil. 1.75 to 2.25	$13.82
Ala. fdy., sil. 2.25 to 2.75	14.32
Tenn. fdy., sil. 1.75 to 2.25	13.82
N'th'n No. 2 foundry	$17.01 to 17.59
S'th'n Ohio silvery, 8%	21.02

Freight rates, $2.02 from Ironton and Jackson, Ohio; $3.82 from Birmingham.

PHILADELPHIA

Per gross ton at Philadelphia:

East. Pa. No. 2	$14.84 to $15.34
East. Pa. No. 2X	15.34 to 15.84
East. Pa. No. 1X	15.84 to 16.34
Basic del'd east. Pa.	16.00
Malleable	18.00 to 18.50
Stand. low phos. (f.o.b. east. Pa. furnace)	22.00 to 23.00
Cop. b'r'g low phos. (f.o.b. furnace)	22.00 to 22.50
Va. No. 2 plain	22.04
Va. No. 2X	22.54

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 84c. to $1.79 from eastern Pennsylvania furnaces; $4.67 from Virginia furnaces.

CLEVELAND

Per gross ton at Cleveland furnace:

N'th'n No. 2 fdy. (local delivery)	$15.50
S'th'n fdy., sil. 1.75 to 2.25	16.14
Malleable (local delivery)	15.50
Ohio silvery, 8 per cent	21.87
Stand. low. phos., Valley	25.00

Prices are f.o.b. furnace except on Southern foundry and silvery iron. Freight rates: 55c. average local switching charge; $3.12 from Jackson, Ohio; $6.14 from Birmingham.

BIRMINGHAM

Per gross ton, f.o.b. Birmingham dist. furnaces:

No. 2 fdy., 1.75 to 2.25 sil.	$11.00
No. 2 soft, 2.25 to 2.75 sil.	11.50
Basic	11.00

CANADA

Per gross ton:

Delivered Toronto

No. 1 fdy., sil. 2.25 to 2.75	$22.60
No. 2 fdy., sil. 1.75 to 2.25	22.10
Malleable	22.60

Delivered Montreal

No. 1 fdy., sil. 2.25 to 2.75	$24.00
No. 2 fdy., sil. 1.75 to 2.25	23.50
Malleable	24.00
Basic	$23.00 to 23.50

Ferromanganese

	Per Gross Ton
Domestic, 80%, seaboard	*$72.00 to $75.00
Foreign, 80%, Atlantic or Gulf port, duty paid	*72.00 to 75.00

*Minimum price quoted for lots of 2000 tons or more.

Spiegeleisen

	Per Gross Ton Furnace
Domestic, 10 to 21%	$26.00 to $27.00

Electric Ferrosilicon

	Per Gross Ton Delivered
50% (carloads)	$77.50
50% (less carloads)	85.00
75% (carloads)	126.00
75% (less carloads)	136.00
14% to 16% (f.o.b. Welland, Ont., in carloads)	31.00
14% to 16% (less carloads)	36.00

Bessemer Ferrosilicon

F.o.b. Jackson County, Ohio, Furnace

Per Gross Ton		Per Gross Ton	
10%	$20.50	14%	$23.50
11%	21.00	15%	24.00
12%	21.50	16%	25.00
13%	22.50	17%	26.50

Silvery Iron

F.o.b. Jackson County, Ohio, Furnace

Per Gross Ton		Per Gross Ton	
6%	$18.00	12%	$20.50
7%	18.50	13%	21.50
8%	18.75	14%	**22.50**
9%	19.00	15%	23.00
10%	19.50	16%	24.00
11%	20.00	17%	25.50

Other Ferroalloys

Ferrotungsten, per lb. wo. del., carloads	$1.08
Ferrotungsten, less carloads	$1.15 to 1.36
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	10.00c
Ferrochromium, 2% carbon	17.00c. to 17.50c.
Ferrochromium, 1% carbon	19.00c. to 20.00c.
Ferrochromium, 0.10% carbon	23.50c. to 25.00c.
Ferrochromium, 0.06% carbon	25.50c. to 27.00c.
Ferrovanadium, del., per lb. contained Va.	$3.05 to $3.30
Ferrocarbontitanium, 15 to 18%, per net ton, f.o.b. furnace, in carloads	160.00
Ferrophosphorus, electric, or blast furnace material, in carloads, 18%, Rockdale, Tenn., base per gross ton	55.00
Ferromolybdenum, per lb. Mo., del.	95c.
Calcium molybdate, per lb. Mo., del.	80c.
Ferrophosphorus, electric, 24% f.o.b. Anniston, Ala., per gross ton	$113.50
Silico spiegel, per ton, f.o.b. furnace, car lots	42.50
Ton lots or less, per ton	47.50
Silico-manganese, gross ton, delivered: 2.50% carbon grade	105.00
1% carbon grade	115.00
Spot prices	$5 a ton higher

Ores

Lake Superior Ores, Delivered Lower Lake Ports

	Per Gross Ton
Old range Bessemer, 51.50% iron	$4.30
Old range non-Bessemer, 51.50% iron	4.65
Mesabi Bessemer, 51.50% iron	4.65
Mesabi non-Bessemer, 51.50% iron	4.50
High phosphorus, 51.50% iron	4.40

Foreign Ore, c.i.f. Philadelphia or Baltimore

	Per Unit
Iron, low phos., copper free, 55 to 58% iron, dry Spanish or Algerian	8c. to 8.50c.
Iron, low phos., Swedish, average 68½ iron	9.00c.
Iron, basic or foundry, Swedish, average 65% iron	8.00c.
Iron, basic and foundry, Russian, aver. 63% iron (nom.)	9.00c.
Manganese, Caucasian, washed 52%	24.00c.
Manganese, African, Indian, 50-52%	23c. to 24c.
Manganese, Brazilian, 46 to 48%	21c. to 22c.

	Per Gross Ton
Tungsten, Chinese wolframite	$10.75 to $11.00
Tungsten, domestic scheelite	$10.00 to 10.50
Chrome, 45%, Cr_2O_3, crude, c.i.f. Atlantic seaboard	18.00
Chrome, 48%, Cr_2O_3, c.i.f. Atlantic seaboard	20.00

Fluorspar

	Per Net Ton
Domestic, washed gravel, 85-5, Kentucky and Illinois mines, freight allowed, Pittsburgh basis	$20.31
No. 2 lump, 85-5, Kentucky and Illinois mines, freight allowed, Pittsburgh basis	22.31
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic port, duty paid	$17.00 to 17.40
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines	32.00

Iron and Steel Scrap

PITTSBURGH

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$9.00 to $10.00
No. 2 heavy melting steel	7.75 to 8.25
No. 2 railroad wrought	9.50 to 10.00
Scrap rails	9.50 to 10.00
Rails 3 ft. and under	10.50 to 11.00
Sheet bar crops, ordinary	9.50 to 10.00
Compressed sheet steel	8.75 to 9.25
Hand bundled sheet steel	7.75 to 8.25
Hvy. steel axle turnings	7.75 to 8.25
Machine shop turnings	6.00
Short shov. steel turnings	6.00 to 7.00
Short mixed borings and turnings	6.00 to 7.00
Cast iron borings	6.00 to 7.00
Cast iron carwheels	9.50 to 10.00
Heavy breakable cast	8.00 to 8.50
No. 1 cast	9.00 to 9.50
Railr. knuckles and couplers	10.00 to 10.50
Rail. coil and leaf springs	10.00 to 10.50
Rolled steel wheels	10.00 to 10.50
Low phos. billet crops	12.50 to 13.00
Low phos. sheet bar crops	11.50 to 12.00
Low phos. plate scrap	10.50 to 11.00
Low phos. punchings	10.50 to 11.00
Steel car axles	13.00 to 13.50

CHICAGO

Delivered Chicago district consumers:

	Per Gross Ton	
Heavy melting steel	$6.00 to	$6.50
Shoveling steel	6.00 to	6.50
Frogs, switches and guards	6.00 to	6.50
Hydraulic comp. sheets	5.00 to	5.50
Drop forge flashings	4.75 to	5.25
No. 1 busheling	4.50 to	5.00
Rolled carwheels	7.25 to	7.75
Railroad tires	8.50 to	9.00
Railroad leaf springs	8.00 to	8.50
Axle turnings	5.00 to	5.50
Steel couplers and knuckles	7.00 to	7.50
Coil springs	8.50 to	9.00
Axle turnings (elec. fur.)	5.50 to	6.00
Low phos. punchings	8.00 to	8.50
Low phos. plates, 12 in. and under	7.50 to	8.00
Cast iron borings	3.25 to	3.75
Short shoveling turnings	3.25 to	3.75
Machine shop turnings	2.75 to	3.25
Rerolling rails	8.50 to	9.00
Steel rails, less than 3 ft.	8.00 to	8.50
Steel rails, less than 2 ft.	8.50 to	9.00
Angle bars steel	7.50 to	8.00
Cast iron carwheels	6.50 to	7.00
Railroad malleable	6.00 to	6.50
Agricultural malleable	5.50 to	6.00
*Relaying rails, 56 to 60 lb.	15.00 to	17.00
*Relay rails, 65 lb. and up	18.00 to	23.00

Per Net ton

Iron angle and splice bars	$5.75 to	$6.25
Iron arch bars, transoms	5.50 to	6.00
Iron car axles	11.50 to	12.00
Steel car axles	8.25 to	8.75
No. 1 railroad wrought	4.25 to	4.75
No. 2 railroad wrought	5.75 to	6.00
No. 1 busheling	4.25 to	4.75

No. 2 busheling	$2.00 to	$2.50
Locomotive tires, smooth	7.50 to	8.50
Pipes and flues	2.50 to	3.00
No. 1 machinery cast	6.50 to	7.00
Clean automobile cast	6.25 to	6.75
No. 1 railroad cast	6.00 to	6.50
No. 1 agricultural cast	5.25 to	5.75
Stove plate	4.75 to	5.25
Grate bars	5.25 to	5.75
Brake shoes	5.50 to	6.00

*Relaying rails, including angle bars in match, are quoted f.o.b. dealers' yards.

PHILADELPHIA

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$6.00 to	$7.00
No. 2 heavy melting steel		5.00
No. 1 railroad wrought	7.00 to	7.50
Bundled sheets	4.50 to	5.00
Hydraulic compressed, new	5.00 to	5.50
Hydraulic compressed, old	4.50 to	5.00
Machine shop turnings	3.50 to	4.00
Heavy axle turnings	6.00 to	6.50
Cast borings (nom.)	3.00 to	3.50
Heavy breakable cast		8.50
Stove plate (steel works)		6.50
No. 1 low phos. hvy.	9.50 to	10.00
Couplers and knuckles	7.00 to	7.50
Rolled steel wheels	7.00 to	7.50
No. 1 blast furname (nom.)	3.00 to	3.50
Spec. iron and steel pipe	5.50 to	6.00
Shafting	10.00 to	11.00
Steel axles	13.50 to	14.00
No. 1 forge fire	5.50 to	6.00
Cast iron carwheels	9.00 to	9.50
No. 1 cast	8.00 to	8.50
Cast borings (chem.)	8.00 to	10.50
Steel rails for rolling	9.00 to	9.50

CLEVELAND

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$7.00 to	$7.25
No. 2 heavy melting steel	6.00 to	6.50
Compressed sheet steel		6.75
Light bundled sheet stampings	6.00 to	6.25
Drop forge flashings	6.00 to	6.25
Machine-shop turnings	3.75 to	4.00
Short shoveling turnings	5.50 to	6.00
No. 1 busheling	6.25 to	6.50
Steel axle turnings	7.50 to	8.00
Low phos., billet crops	14.00 to	14.50
Cast iron borings	4.00 to	4.50
Mixed borings and short turnings	4.00 to	4.50
No. 2 busheling	4.00 to	4.50
No. 1 cast	7.50 to	8.00
Railroad grate bars	6.00 to	6.50
Stove plate	6.00 to	6.50
Rails under 3 ft.	10.00 to	10.50
Rails for rolling	11.00 to	12.00
Railroad malleable	9.50 to	10.00
Cast iron carwheels	7.50 to	8.00

BUFFALO

Per gross ton, f.o.b. Buffalo consumers' plants:

No. 1 heavy melting steel		$7.00
No. 2 heavy melting scrap		5.00
Scrap rails	$7.00 to	$7.50
New hydraul. comp. sheets		5.00
Old hydraul. comp. sheets		4.00
Drop forge flashings		5.00
No. 1 busheling		5.00
Hvy. steel axle turnings		6.50
Machine shop turnings		5.00
Knuckles and couplers		10.00
Coil and leaf springs		10.00
Rolled steel wheels		10.00
Low phos. billet crops	10.50 to	11.00
Short shov. steel turnings	6.00 to	6.50
Short mixed borings and turnings	5.00 to	5.50
Cast iron borings	5.00 to	5.50
No. 2 busheling	3.50 to	4.00
Steel car axles	10.00 to	11.00
Iron axles	10.00 to	11.00
No. 1 machinery cast	9.00 to	9.50
No. 1 cupola cast	8.25 to	8.75
Stove plate	7.25 to	7.50
Steel rails, 3 ft. and under	10.00 to	10.50
Cast iron carwheels	8.00 to	9.00
Industrial malleable	8.00 to	8.50
Railroad malleable	8.00 to	8.50
Chemical borings	7.50 to	8.00

BIRMINGHAM

Per gross ton delivered consumers' yards:

Heavy melting steel	$7.50 to	$8.00
Scrap steel rails	7.50 to	8.00
Short shoveling turnings	3.50 to	4.00
Stove plate		6.00
Steel axles		12.00
Iron axles		12.00
No. 1 railroad wrought		6.00
Rails for rolling	9.00 to	9.50
No. 1 cast	8.00 to	8.50
Tramcar wheels		8.50
Cast iron borings, chem.		8.50

ST. LOUIS

Dealers' buying prices per gross ton:

Selected heavy steel	$6.75 to	$7.25
No. 1 heavy melting	6.25 to	6.75
No. 2 heavy melting	5.50 to	6.00
No. 1 locomotive tires	5.25 to	5.75
Misc. stand-sec. rails	6.50 to	7.00
Railroad springs	7.50 to	8.00
Bundled sheets	4.25 to	4.75
No. 2 railroad wrought	6.25 to	6.75
No. 1 busheling	5.00 to	5.50
Cast iron borings and shoveling turnings	4.75 to	5.25
Iron rails	7.00 to	8.00
Rails for rolling	8.00 to	8.50
Machine shop turnings	3.00 to	3.50
Heavy turnings	5.00 to	5.50
Steel car axles	9.50 to	10.00
Iron car axles	12.50 to	13.00
Wrot. iron bars and trans.	5.00 to	5.50
No. 1 railroad wrought	4.75 to	5.25
Steel rails, less than 3 ft.	8.50 to	9.00
Steel angle bars	6.50 to	7.00
Cast iron carwheels	5.50 to	6.00
No. 1 machinery cast	7.50 to	8.00
Railroad malleable	4.75 to	5.25
Steve plate	6.00 to	6.50
Relay, rails, 60 lb. and under	15.00 to	16.50
Relay, rails, 70 lb. and over	20.00 to	21.00
Agricult. malleable	5.00 to	5.50

NEW YORK

Dealers' buying prices per gross ton:

No 1 heavy melting steel	$4.00 to	$4.50
No. 2 heavy melting steel	2.00 to	2.25
Heavy melting steel (yard)	1.50 to	2.00
No. 1 hvy. breakable cast.	4.50 to	4.75
Stove plate (steel works)	2.25 to	2.75
Machine shop turnings	0.50 to	1.00
Short shoveling turnings	0.50 to	1.00
Cast borings	0.50 to	1.00
No. 1 blast furnace	0.50 to	1.00
Steel car axles	9.75 to	10.00
Iron car axles (nom.)	14.00 to	14.50
Spec. iron and steel pipe.	2.00 to	2.50
Forge fire		3.25
No. 1 railroad wrought	4.00 to	4.50
No. 1 yard wrought, long	3.25 to	3.50
Rails for rolling	5.00 to	5.50
No. 1 cast	5.00 to	5.25
No. 2 cast	4.00 to	4.50
Stove plate (foundry)		3.25
Malleable cast (railroad)	4.50 to	5.00
Cast borings (chemical)	6.00 to	6.50

Per gross ton, delivered local foundries:

No. 1 machinery cast		$8.00
No. 1 hvy. cast (cupola size)		7.50
No. 2 cast		6.50

BOSTON

Dealers' buying prices per gross ton:

No. 1 heavy melting steel	$4.00 to	$4.25
Scrap T rails	3.80 to	4.00
Machine shop turnings	.80 to	1.00
Cast iron borings		1.05
Bundled skeleton, long	2.00 to	2.50
Forge flashings	3.00 to	3.50
Blast furnace scrap	0.90 to	1.00
Forge scrap	3.00 to	3.25
Shafting	9.50 to	10.00
Steel car axles	9.00 to	9.50
Wrought pipe	4.00 to	4.25
Rails for rolling	6.00 to	6.50
Cast iron borings, chemical	7.00 to	7.25

Per gross ton delivered consumers' yards:

Textile cast	$7.00 to	$7.50
No. 1 machinery cast	7.50 to	8.00
Stove plate	5.00 to	5.25
Railroad malleable	10.50 to	11.00

CINCINNATI

Dealers' buying prices per gross ton:

Heavy melting steel	$6.00 to	$7.00
Scrap rails for melting	8.00 to	8.50
Loose sheet clippings	1.50 to	2.00
Bundled sheets	4.75 to	5.25
Cast iron borings	2.75 to	3.25
Machine shop turnings	3.25 to	3.75
No. 1 busheling	4.25 to	4.75
No. 2 busheling	2.50 to	3.00
Rails for roling	9.00 to	9.50
No. 1 locomotive tires	8.50 to	9.00
Short rails	11.75 to	12.25
Cast iron carwheels	8.25 to	8.75
No. 1 machinery cast	10.00 to	10.50
No. 1 railroad cast	8.75 to	9.25
Burnt cast	4.25 to	4.75
Stove plate	4.25 to	4.75
Agricultural malleable	8.00 to	8.50
Railroad malleable	9.00 to	9.50

DETROIT

Dealers' buying prices per gross per ton:

Hvy. melting steel	$4.75 to	$5.25
Borings and short turnings	2.50 to	3.00
Long turnings	1.75 to	2.25
No. 1 machinery cast	7.50 to	8.00
Automotive cast	9.75 to	10.25
Hydraul. comp. sheets	4.75 to	5.25
Stove plate	3.75 to	4.25
New No. 1 busheling	3.75 to	4.25
Old No. 2 busheling	2.00 to	2.50
Sheet clipping	2.00 to	2.50
Flashings	3.75 to	4.25

CANADA

Dealers' buying prices per gross ton:

	Toronto	Montreal
Heavy melting steel	$7.00	$6.00
Rails, scrap	7.00	6.00
No. 1 wrought	6.00	8.00
Machine shop turnings	2.00	2.00
Boiler plate	5.00	4.50
Heavy axle turnings	2.50	2.50
Cast borings	2.00	2.00
Steel borings	2.00	2.00
Wrought pipe	2.00	2.00
Steel axles	7.00	9.00
Axles, wrought iron	7.00	11.00
No. 1 machinery cast	12.50	10.00
Stove plate	10.00	8.00
Standard carwheels	11.00	8.50
Malleable	10.00	9.00

Warehouse Prices for Steel Products

PITTSBURGH

	Base per Lb.
Plates	2.85c.
Structural shapes	2.85c.
Soft steel bars and small shapes	2.60c.
Reinforcing steel bars	2.60c.
Cold-finished and screw stock—	
Rounds and hexagons	3.10c.
Squares and flats	3.60c.
Bands	2.95c.
Hoops	3.60c.
Hot-rolled annealed sheets (No. 24), 25 or more bundles	3.15c.
Galv. sheets (No. 24), 25 or more bundles	3.65c.
Hot-rolled sheets (No. 10)	3.10c.
Galv. corrug. sheets (No. 28), per square (less than $750 lb.)	$3.74
Spikes, large	2.50c.
Small	2.75c. to 2.90c.
Rost	3.00c.
Track bolts, all sizes, per 100 count, 70 and 10 per cent off list	
Machine bolts, 100 count, 70 and 10 per cent off list	
Carriage bolts, 100 count, 70 and 10 per cent off list	
Nuts, all styles, 100 count, 73 and 10 per cent off list	
Large rivets, base per 100 lb	$3.00
Wire, black, soft ann'l'd, base per 100 lb.	2.75
Wire, galv. soft, base per 100 lb.	3.20
Common wire nails, per keg	2.35
Cement coated nails, per keg	2.35

*On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applied to orders of 400 to 999 lb.

CHICAGO

	Base per Lb.
Plates and structural shapes	3.00c.
Soft steel bars	2.75c.
Reinforcing bars, billet steel	1.75c.
Rail steel reinforcement	1.55c. to 1.65c.
Cold-fin. steel bars and shafting—	
Rounds and hexagons	3.10c.
Flats and squares	3.60c.
Bands, $\frac{7}{16}$ in. (in Nos. 10 and 12 gages)	2.95c.
Hoops (No. 14 gage and lighter)	3.50c.
Hot-rolled annealed sheets (No. 23)	3.55c.
Galv. sheets (No. 24)	4.10c.
Hot-rolled sheets (No. 10)	3.20c.
Spikes ($\frac{7}{16}$ in. and lighter)	3.45c.
Track bolts	4.30c.
Rivets, structural	3.75c.
Rivets, boiler	3.75c.

	Per Cent Off List
Machine bolts	73
Carriage bolts	73
Coach and lag screws	73
Hot-pressed nuts, sq., tap, or blank	73
Hot-pressed nuts, hex., tap, or blank	73
No. 8 black ann'l'd wire, per 100 lb.	$3.45
Com. wire nails, base per keg	2.30
Cement c't'd nails, base per keg	2.30

NEW YORK

	Base per Lb.
Plates and struc. shapes	2.70c. to 3.10c.
Soft steel bars, small shapes	2.70c. to 3.10c.
Iron bars	3.34c.
Iron bars, Swed, charcoal	6.00c. to 6.50c.
Cold-fin. shafting and screw stock:	
Rounds and hexagons	3.40c.
Flats and squares	3.90c.
Cold-roll. strip, soft and quarter hard	4.95c.
Hoops	3.75c.
Bands	3.40c.
Hot-rolled sheets (No. 10)	3.00c. to 3.25c.
Hot-rolled ann'l'd sheets (No. 24*)	3.50c.
Galvanized sheets (No. 24*)	4.00c.
Long terne sheets (No. 24)	4.50c.
Standard tool steel	12.00c.
Wire, black annealed (No. 10)	3.60c.
Wire, galv. annealed (No. 10)	4.05c.
Tire steel, $\frac{1}{2}$ x $\frac{1}{2}$ in. and larger	3.40c.
Smooth finish, 1 to 2$\frac{1}{2}$ x $\frac{1}{4}$ in. and larger	3.75c.
Open-hearth spring steel, bases	4.50c. to 7.00c.
Common wire nails, base, per keg	$2.60
Machine bolts, cut thread:	Per Cent Off List
$\frac{3}{4}$ x 6 in. and smaller	65 to 65 and 10
1 x 30 in. and smaller	65 to 65 and 10
Carriage bolts, cut thread:	
$\frac{1}{2}$ x 6 in. and smaller	65 to 65 and 10
$\frac{3}{4}$ x 20 in. and smaller	65 to 65 and 10
Boiler Tubes:	Per 100 Ft.
Lap welded, 2-in.	$19.00
Seamless welded, 2-in.	20.25
Charcoal iron, 2-in.	26.25
Charcoal iron, 4-in.	67.00

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

ST. LOUIS

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.00c.
Cold-fin. rounsd, shafting, screw stock	3.35c.
Hot-rolled annealed sheets (No. 24)	2.50c.
Galv. sheets (No. 24)	4.35c.
Hot-rolled sheets (No. 10)	3.45c.
Black corrug. sheets (No. 24)	3.85c.
Galv. corrug. sheets	4.40c.
Structural rivets	4.00c.
Boiler rivets	4.60c.

	Per Cent Off List
Tank rivets, $\frac{7}{8}$-in. and smaller, 100 lb. or more	65
Less than 100 lb	60
Machine bolts	70
Carriage bolts	70
Lag screws	70
Hot-pressed nuts, sq., blank or tapped, 200 lb. or more	70
Less than 200 lb	60
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more	70
Less than 200 lb	60

PHILADELPHIA

	Base per Lb.
Plates, $\frac{1}{4}$-in. and heavier	2.45c.
Structural shapes	2.45c.
Soft steel bars, small shapes, iron bars (except bands)	2.45c.
Reinforc. steel bars, sq., twisted and deform.	2.30c.
Cold-fin. steel, rounds and hex.	3.30c.
Cold-fin. steel, sq. and flats	3.80c.
Steel hoops	3.60c.
Steel bands, No. 12 to 3/16-in., incl.	2.75c.
Spring steel	5.00c.
Hot-rolled annealed sheets (No. 24)	3.55c.
Galvanized sheets (No. 24)	3.75c.
Hot-rolled and annealed sheets (No. 10)	3.05c.
Diam. pat. floor plates, $\frac{1}{4}$ in.	5.00c.
Swedish iron bars	5.60c.

These prices are subject to quantity differentials except on reinforcing and Swedish iron bars.

CLEVELAND

	Base per Lb.
Plates and struc. shapes	2.95c.
Soft steel bars	2.75c.
Reinforc. steel bars	1.75c. to 1.95c.
Cold-fin. rounds and hex	3.10c.
Cold-fin. flats and sq.	3.60c.
Hoops and bands, No. 12 to $\frac{1}{4}$ in., inclusive	3.00c.
Hoops and bands, No. 13 and lighter	3.55c.
Cold-finished strip	*5.55c.
Hot-rolled annealed sheets (No. 24)	3.25c.
Galvanized sheets (No. 24)	3.75c.
Hot-rolled sheets (No. 10)	3.00c.
Black ann'l'd wire, per 100 lb.	$2.75
No. 9 galv. wire, per 100 lb	3.20
Com. wire nails, base per keg	2.35

*Net base, including boxing and cutting to length.

CINCINNATI

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.00c.
New billet reinforc. bars	3.00c.
Rails steel reinforc. bars	3.00c.
Hoops	3.90c.
Bands	3.20c.
Cold-fin. rounds and hex	3.50c.
Squares	4.00c.
Hot-rolled annealed sheets (No. 24)	3.75c.
Galv. sheets (No. 24)	4.25c.
Hot rolled sheets (No. 10)	3.20c.
Structural rivets	4.10c.
Small rivets	60 per cent off list
No. 9 ann'l'd wire, per 100 lb.	$3.00
Com. wire nails, base per keg (10 to 49 kegs)	2.60
Larger quantities	2.50
Cement c't'd nails, base 100-lb. keg	2.95
Chain, per 100 lb	10.25

	Net per 100 Ft.
Seamless steel boiler tubes, 2-in.	$17.50
4-in.	36.00
Lap-welded steel boiler tubes, 2-in.	16.50
4-in.	34.50

BUFFALO

	Base per Lb.
Plates and struc. shapes	3.25c.
Soft steel bars	3.00c.
Reinforcing bars	2.65c.
Cold-fin. flats and sq.	3.65c.
Rounds and hex	3.15c.
Cold-rolled strip steel	5.25c.
Hot-rolled annealed sheets (No. 24)	3.70c.
Galv. sheets (No. 24)	4.10c.
Bands	3.35c.
Hoops	3.90c.
Hot-rolled sheets (No. 10)	3.50c.
Com. wire nails, base per keg	$2.45
Black wire, base per 100 lb.	3.10

BOSTON

	Base per Lb.
Plates	*3.35c.
Structural shapes	*3.35c.
Soft steel bars, small shapes	*3.25c.
Reinforcing bars	3.10c. to 3.25c.
Iron bars—	
Refined	3.25c.
Best refined	4.60c.
Spring steel, open-hearth	5.00c.
Tire steel	4.50c. to 4.75c.
Bands	*3.75c. to 4.25c.
Hoop steel	4.90c. to 5.40c.
Cold-rolled steel—	
Rounds and hex	3.90c. to 5.50c.
Squares and flats	4.00c. to 6.00c.
Rivets, structural or boiler	4.80c.

	Per Cent Off List
Machine bolts	70
Carriage bolts	70
Lag screws	70
Hot-pressed nuts	40 and 10
Cold-punched nuts	40 and 10
Stove bolts	70 and 10

*Base price (250 to 999 lb.); less than 250 lb., add 50c. per 100 lb.; 1000 to 7999 lb., deduct 15c.; 8000 to 14,999 lb., deduct 25c.; 15,000 lb. and larger lots, deduct 35c.

PACIFIC COAST

	Base Per Lb. San Francisco	Los Angeles	Seattle
Plates and struc. shapes, $\frac{1}{4}$-in. and heavier	3.15c.	3.15c.	2.75c.
Soft steel bars	3.15c.	3.15c.	2.75c.
Reinforcing bars	2.80c.	2.80c.	3.00c.
Hot-rolled annealed sheets (No. 24)	3.95c.	4.20c.	4.25c.
Hot-rolled sheets (No. 10)	3.50c.	3.50c.	3.75c.
Galv. sheets (No. 24)	4.50c.	4.50c.	4.75c.
Struc. rivets, $\frac{1}{2}$ in. and larger, less than 1000 lb	5.00c.	5.00c.	4.00c.
Cold-finished steel bars and shafting:			
Rounds	5.25c.	5.15c.	4.35c.
Squares	6.25c.	6.15c.	5.50c.
Hexagons	6.25c.	5.15c.	5.50c.
Flats	6.75c.	6.15c.	6.50c.
Common wire nails, base per keg in less carloads	$2.75	$2.75	$2.85

Plates, shapes, bars, bands and hot-rolled sheets, No. 16 gage and heavier, subject to differentials for quantity.

PLANT EXPANSION AND EQUIPMENT BUYING

Machine Tool Business Gained in April

Index of Sales of National Association of Machine Tool Builders Shows Rise

MACHINE tool orders gained in April for the first time since December, according to the report of the National Machine Tool Builders' Association. The index figure on sales in April is 41.1 against 32.6 in March, 37.6 in February and 59.1 in January. Last year the index figure on sales declined every month beginning with April until November, when there was a slight rise followed by a further moderate gain in December, since when the trend has been downward up to last month.

A surprising development is that seven companies reported to the association that their April orders were equal to or larger than their individual base figures, which represent the average of shipments in 1922, 1923 and 1924.

Shipments in April were at about the same rate as in March, but slightly higher than in January and February. Unfilled orders as of April 30 were 1.23 times the April shipments and a little under twice the volume of orders received during the month. It is indicated that some orders placed early in the year were released for shipment.

The April gain in orders was not sufficient to lift the association's three-months moving average, which stands at 37.1 against 43.1 in March.

Some encouragement is derived from the willingness of prospective buyers of machine tools to state their ultimate requirements. Many companies know that they will have need of equipment as soon as business recovery has begun and these potential orders are being carefully scheduled by machine tool builders and dealers so that they may be prepared to anticipate the particular types of tools that will be purchased. The necessity that many manufacturers face of reducing unit costs in production will ultimately create a considerable demand for tools of improved design.

◀ NORTH ATLANTIC ▶

General Electric Co., Schenectady, N. Y., will take bids soon on general contract through General Electric Realty Co., New York, for three-story factory branch, storage and distributing plant, with shop facilities, 210 x 220 ft., at Minneapolis, Minn., with foundations for two additional stories later. Cost over $400,000 with equipment.

United Fuel Service, Inc., 282 South Street, New York, leased 45,000 sq. ft. at foot of Tiffany Street and East River, and plans construction of coal pockets, with conveying, loading and other equipment. Cost over $45,000 with equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until May 24 for eight lubricating oil pumps (Schedule 7992), one gasoline engine-driven power tractor mower (Schedule 8013), 16,000 lubricating gun fittings (Schedule 8046), 510 mechanical telegraph brass chains (Schedule 8016), goggles, goggle frames, sandblasting helmets, etc. (Schedule 8008), and quantity of safety treads (Schedule 8042) for New York Navy Yard.

Standard Brooklyn Windshield Co., Brooklyn, organized by Max Penn, 745 Lafayette Avenue, and Harry Berger, 392-A Pulaski Street, to manufacture automobile windshields, frames and kindred equipment.

Spingler Electric Corpn., New York, care of Smith, Chambers & Clare, 60 Broadway, attorneys, recently organized, has applied for permission to build an electric power plant for service in district bounded by Thirteenth to Fifteenth Streets, Union Square and University Place. Cost over $150,000 with equipment and lines.

Signal Supply Officer, Army Base, Brooklyn, asks bids until May 24 for 400 guys (Circular 138).

Trojan Founders, Inc., Brooklyn, has been organized by Benjamin and William Tamaroff, 1933 Union Street, to manufacture iron, brass, bronze and other metal castings.

New York Power & Light Co., 126 State Street, Albany, N. Y., is planning construction of transmission lines near Cherry Valley and Arietta.

New York & Richmond Gas Co., 691 Bay Street, St. George, S. I., is planning erection of storage tanks and gas distributing facilities at Eltingville, S. I.

Department of Public Affairs, City Hall, Newark, Jerome T. Congleton, mayor, director, asks bids until May 26 for truck equipment for part of new city railway line, including rails, rail joints, rail braces, special malleable and gray iron castings, bolts, spikes, tie plates, washers, etc.

Leo Schloss, Inc., foot of Astor Street, Newark, meat packer, let general contract to Essex Construction Co., 9 Hackett Street, for one-story and basement addition. Cost over $35,000 with equipment. Stadler Engineering Co., 140 Liberty Street, New York, architect and engineer.

National Union Radio Corpn., 57 State Street, Newark, is running on full time 5½-day week production schedule at two local plants, giving employment to about 650 persons, with bulk of output given over to radio tubes.

Landon P. Smith, Inc., 130 Coit Street, Irvington, N. J., manufacturer of hardware specialties, glaziers' tools, etc., has taken over former local factory of Smith & Hemingway Co. for expansion. Company will remove branch plants from Hill, N. H., and Windsor, Vt., to Irvington, where production will be concentrated. It is planned to manufacture additional products, including a new hand-type floor scraper.

Board of Education, Committee on Supplies, 9 South Stockton Street, Trenton, N. J., asks bids until May 23 for manual training equipment and supplies for public schools. Charles B. Warren is superintendent of supplies.

Chamber of Commerce, Hotel Stacy Trent, Trenton, N. J., Walter O. Lochner, secretary, is in contact with a manufacturer of metal pipe and tubing, name temporarily withheld, which is negotiating with City Commission for lease of about 29,500 sq. ft. in former Thropp plant, for establishment of plant.

Commanding Officer, Frankford Arsenal, Philadelphia, asks bids until June 6 for one tracer bullet automatic charging and compression equipment (Circular 470); until June 10 for two bullet weighing machines (Circular 468).

National Casket Co., 2041-43 Arch Street, Philadelphia, let general contract to Turner Construction Co., Philadelphia, for four-story and basement factory branch, storage and distributing plant, 45 x 155 ft. Cost about $100,000 with equipment.

City Council, Dover, Del., L. D. Shank, city manager, is planning extensions and improvements in municipal light and power plant, including installation of turbine unit. Cost about $43,000.

Supply Officer, Naval Aircraft Factory, Navy Yard, Philadelphia, asks bids until May 23 for 200, 220 and 750 gross, respectively, machine screws of different sizes, and 12,500 steel wing nuts (Aero Req. 1396).

Board of Trustees, Free Library of Philadelphia, Cyrus Adler, president, Logan Square, Philadelphia, asks bids until June 1 for aluminum chairs, steel and bronze museum cases, etc.

Lind Mfg. Co., Williamsport, Pa., has been organized by Jacob C. Brown and L. B. Lindheimer, Williamsport, to manufacture steel specialties.

Bureau of Water, Department of Public Works, City Hall Annex, Philadelphia, asks bids until June 2 for cast iron bell and spigot water pipe and special castings (Contract 1043), valves (Contract 1041), low pressure fire hydrants (Contract 1042), valve boxes (Contract 1040), cast iron sleeves for pump service (Contract 1039).

A. M. Dellinger, Inc., Lancaster, Pa., has been organized with capital of $100,000 to take over plant and business of A. M. Dellinger, 723 North Prince Street, manufacturer of agricultural implements and equipment. Martin C. and Paul C. Dellinger head new company.

Allen Paper Machinery & Engineering Works, Inc., Glens Falls, N. Y., recently organized by Carlton H. Allen, 244 Glen Street, and Harold D. Wells, 43 Grant Avenue, will operate plant for manufacture of proportioning and metering equipment, regulators and other machinery for pulp and paper mills, and equipment for rolling mills.

Ontario Elevators, Ltd., care of G. C. Leitch, 200 Bay Street, Toronto, Ont., plans new grain elevator on Grampus Bay, Oswego, N. Y. Cost over $300,000 with equipment.

Consolidated Aircraft Corpn., 2050 Elmwood Avenue, Buffalo, has secured contracts from Transcontinental & Western Air Lines, and Ludington Lines, for 10 transport airplanes, totaling close to $250,000, and will advance operations.

Seatrain Lines, Inc., 11 Broadway, New York, has awarded contract to Shepard-Niles Crane & Hoist Corpn., Montour Falls, N. Y., for a 125-ton eight-wheel, 68 ft. span car-handling crane for installation at its Hoboken, N. J., terminus. Crane will have clear height underneath of 70 ft., and a maximum operating speed of 60 ft. a min.

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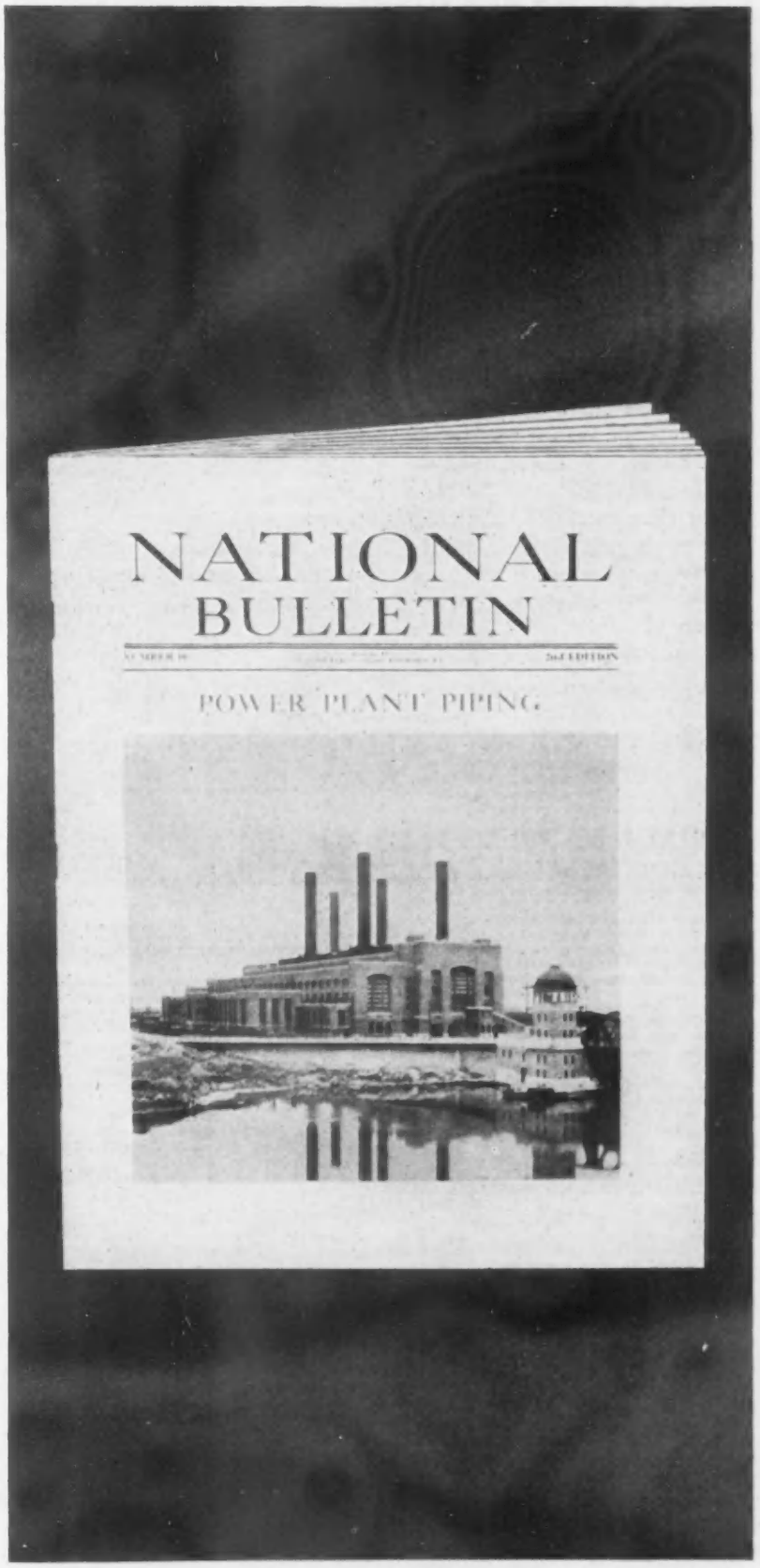

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American Steel and Wire Company
Carnegie Steel Company
Columbia Steel Company
Cyclone Fence Company
Federal Shipbuilding and Dry Dock Company
Illinois Steel Company
Minnesota Steel Company
National Tube Company
Oil Well Supply Company
The Lorain Steel Company
Tennessee Coal, Iron & R. R. Company
Universal Atlas Cement Company

Pacific Coast Distributors—Columbia Steel Company, Russ Building, San Francisco, Calif. *Export Distributors*—United States Steel Products Company, 30 Church Street, New York, N. Y.

SOUTH ATLANTIC

Chemical Warfare Service, Edgewood Arsenal, Md., asks bids until May 23 for one gasoline crawler type shovel (Circular 81).

J. A. Jones Construction Co., Commercial Bank Building, Charlotte, N. C., contractor for Government work at Panama Canal, Canal Zone, is purchasing new and reconditioned machinery. Company has inquiries out for gasoline-driven tractors, crawler type, 60 and 90-hp. capacity, with hoist attachment, and gasoline-operated skidding machines, 130 to 150-hp. rating.

Concrete Products Co., Norfolk, Va., manufacturer of reinforced-concrete pipe, will establish a branch plant at Dover, Del. Equipment will be electric-operated.

Bureau of Yards and Docks, Navy Department, Washington, asks bids until May 25 for cables, transformers, switchboard, light standards, insulators and other kindred equipment for marine barracks at Quantico, Va., (Specification 6718).

Huntington Steel Products Co., Huntington, W. Va., recently organized, has taken over local plant and business of Huntington Iron Works, and will specialize in structural and ornamental iron products. Company has also purchased plant of Renchok Iron Works, 1011 Monroe Avenue, and will remove to Huntington plant, where expansion program will be carried out. Cost over $40,000 with equipment. D. W. Allan and M. B. Mitchell head new company.

United States Coast Guard Headquarters, Washington, asks bids until May 27 for 35,000 ft. cable.

Department of Agriculture, Division of Purchase, Washington, asks bids until May 24 for one electric extraction equipment for Logan, Utah (Proposal 1744).

Ford Motor Co., Dearborn, Mich., has resumed production at assembling plant at Atlanta, Ga., following curtailment since last October. Works are giving employment to about 500 men on five-day week schedule, this quota to be increased to over 800 men soon.

Monumental Welding Works, Inc., has been organized to take over and expand company of same name with plant at 3901 Philadelphia Road, Harry Gaedke and William F. Goehring head new company.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until May 24 for steel and copper-nickel alloy forgings (Schedule 8017) for Newport Navy Yard, one gasoline-driven truck and lift (Schedule 8056) for Norfolk Navy Yard, one universal cutter bench-type grinder and one motor-driven engraving machine (Schedule 7999) for New York or San Francisco Navy Yard, 15 sets automatic temperature controllers and relays (Schedule 7986) for Washington Navy Yard, metal aircraft propeller and hubs (Schedule 7888), air ejector equipment and spare parts (Schedule 7990), power plant and equipment and winches, rotating and spare parts (Schedule 8039), and until May 31 for steel pipe and tubing (Schedule 8029), centrifugal pumps and spare parts (Schedule 8028), switchboards and spare parts (Schedule 8003), faucets and valves (Schedule 8038) all for Eastern and Western yards; couplings, gasket clamps and air hose clamps (Schedule 8034) for Philadelphia, Hampton Roads and Puget Sound Navy Yards.

Cohutta Talc Co., Dalton, Ga., is planning installation of a pulverizer and separator, capacity for grinding about 1½ tons an hour.

SOUTHWEST

Eagle-Picher Mining & Smelting Co., Picher, Okla., has superstructure under way on new lead and zinc ore and concentrating mill near Commerce, Okla., and expects to have units ready for service in September. Cost over $400,000 with machinery.

Sayles Corpn., Kansas City, Mo., has been organized by J. F. Porter, Jr., 5318 Locust Street, and associates to manufacture sadirons and kindred products.

St. Louis Southwestern Railroad Co., St. Louis, has resumed operations at division shops at Pine Bluffs, Ark., reinstating about 200 men on five-day week basis.

Alma Realty & Investment Co., St. Louis, plans purchase of three 1000-gal. capacity gasoline tanks, pumping equipment and auxiliary equipment.

Board of Trustees, Bascone College, Muskogee, Okla., plans erection of one story industrial arts building in connection with building program. Cost of entire project about $140,000. Dr. B. D. Weeks, president, in charge.

City Council, Idabel, Okla., is considering erection of a municipal electric light and power plant. Cost close to $90,000 with equipment. F. D. Taffee, Idabel, is engineer.

Spencer S. Swasey, 2142 Railway Exchange Building, St. Louis, is planning purchase of a 1-yd. capacity clamshell bucket, and 4 to 6-yd. capacity dragline bucket unit, Diesel engine or electric-operated, for sand and gravel.

United Gas Public Service Co., Rusk Building, Houston, Tex., is planning erection of new four-unit compressor plant near Longview, Tex. Cost over $50,000 with equipment.

American Airways, Inc., Dallas, Tex., Southern Division, a unit of Aviation Corpn., New York, is planning erection of new hangar, 120 x 230 ft., at municipal airport, Fort Worth, Tex., with repair and reconditioning shop. Headquarters will be maintained at latter place and present shops removed from Dallas. Cost about $100,000 with equipment. C. R. Smith is general manager of Southern division.

Tidal Oil Co., Kilgore, Tex., a subsidiary of Tide Water Oil Co., 17 Battery Place, New York, has purchased 134 acres of oil lands of Cordova Union Oil Corpn., in Kilgore district, Rusk County, for about $400,000. Purchasing company plans expansion and development at eight producing wells on tract, including pipe line installations, etc.

Reynolds Electrical & Engineering Co., El Paso, Tex., has been organized by J. P. Henderson and L. J. Reynolds, to manufacture electrical and mechanical products.

Rex Young, Grandfield, Okla., is at head of project to build an oil refinery at Pilot Point, Tex. Cost over $75,000 with equipment.

Western Wire Products Co., St. Louis, has purchased two buildings at corner of Eighteenth and McNulty Streets, totaling about 35,000 sq. ft., for expansion. Company will remove to new location and with additional equipment to be installed, facilities will be increased more than 50 per cent.

NEW ENGLAND

Edison Electric Illuminating Co., 39 Boylston Street, Boston, plans extensions in steam lines for local central steam heating service. Cost about $500,000 with equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until May 24 for one automatic steering equipment and spare parts (Schedule 7996) for Portsmouth Navy Yard; one electric industrial truck (Schedule 8062), and until May 31 for 1000 steel leg platforms and electric tractor without floor boards (Schedule 8060) for Boston Navy Yard.

Dore Mfg. Corpn., Boston, has been organized by Frank M. Dore, 13 Central Square, East Boston, and associates to manufacture electrical and mechanical devices and equipment.

Colonial Beacon Oil Co., 30 Beacham Street, Everett, Mass., has awarded general contract to C. O. Olsson, 515 Massachusetts Avenue, Cambridge, Mass., for new bulk oil storage and distributing plant at Worcester, Mass. Cost over $40,000 with equipment.

Barrett Co., Everett, Mass., manufacturer of roofing products, road materials, etc., will begin work in June on new plant on 14-acre tract recently acquired at Malden, Mass., to include wharf with unloading and conveying equipment, and battery of heavy tanks. Cost close to $150,000 with equipment. Other units will be built later. Headquarters are at 40 Rector Street, New York.

Service Battery Shop, 263 Broadway, Providence, R. I., has plans for one-story branch works at Cranston, R. I. Cost about $24,000 with equipment. F. Chiaverini, 32 Broadway, Providence, is architect.

SOUTH CENTRAL

Franklin Power & Light Co., Franklin, Tenn., is arranging for stock issue of $150,000, majority of fund to be used for power plant and power line construction.

Illinois Central Railroad, 135 East Eleventh Place, Chicago, will concentrate repair operations in Kentucky district at shops at Paducah. Motor repair shops at Princeton and Dyersburg, Tenn., will be transferred to that point and operated as one unit. Testing department for dispatch service will be removed from Chicago to Paducah.

Mengel Co., Louisville, manufacturer of wire-bound and other boxes and containers, is considering expansion at branch plant at Winston-Salem, N. C., and will remove department from Louisville to that point. New division at Winston-Salem will be under direction of William Colvin.

Central Foundry Co., Bessemer, Ala., has resumed operations for production of soil pipe and will give employment to about 200 men on three-day week schedule.

Department of Agriculture, Division of Purchase, Washington, asks bids until May 24 for one band saw, one portable keyseating machine, one jointer and one drum sander for Stoneville, Miss. (Proposal 1739).

Goslin-Birmingham Mfg. Co., Birmingham, manufacturer of pipe, castings, etc., has resumed operations with partial working force.

MILWAUKEE

G. R. Worth-Harmes Gear & Machine Works, Inc., Milwaukee, has been granted a charter to manufacture machine tools, machinery, engines, etc. The principals are G. R. Worth, Earl V. Harmes, C. S. Henningfeld and Ernest E. Harmes, 3454 North Newhall Street. Negotiations for leased quarters are under way.

Froedtert Grain & Malting Co., South Thirty-eighth and West Grant Streets, Milwaukee, has plans by Fred J. Postel, consulting engineer, 3444 North Hackett Avenue, for power plant improvements costing $45,000 in its plant at Winona, Minn. Two 250-hp. water tube boilers are included in requirements.

Chandelier Art Metal Co., Watertown, Wis., has been organized by Herbert W. Vore and Fred Ehrensperger to manufacture lighting fixtures, grille and wrought metal work. Plant is being established at 200 First Street.

New Stoughton Co., Stoughton, Wis., has been incorporated to take over business of Stoughton Co., manufacturer of automobile, motor truck and motor bus bodies, gray iron and malleable castings, forgings, etc. F. J. Vea, president of Stoughton Co., I. A. Fagerland and James R. Bowen, all of Stoughton, are principals in new organization.

CANADA

Wunder Furniture Mfg. Co., Ltd., 280 Victoria Street, Kitchener, Ont.; plant recently destroyed by fire. Will be rebuilt at cost of $100,000.

H. M. Fair, Delhi, Ont., will build extension to plant at Tillsonburg, Ont., and install additional equipment, cost $25,000. Owner is inquiring for a new steam boiler, 100 lb. pressure.

Town Council, Aurora, Ont., will call bids soon for sewage disposal plant and equipment. Cost $30,000. M. G. Andrews is clerk. James, Proctor & Redfern, Ltd., 36 Toronto Street, Toronto, engineer.

CENTRAL DISTRICT

Gulf Refining Co., Frick Annex, Pittsburgh, has authorized erection of new bulk oil storage and distributing plant at Paducah, Ky., consisting of total tank capacity of 75,000 gal., divided into five units. Cost $80,000 with equipment.

Pittsburgh Equitable Meter Co., 400 North Lexington Avenue, Pittsburgh, manufacturer of water, gas and gasoline meters, parts, etc., is arranging for increase in capital from $1,150,000 to $2,150,000, preferred stock, and from $100,000 to $150,000, common stock, part of fund to be used for general expansion.

West Penn Power Co., West Penn Building, Pittsburgh, has acquired large block of common stock of Monongahela-West Penn Public Service Co., operating at Fairmont, W. Va., and vicinity, and will operate as a direct subsidiary. Line construction and other extensions will be carried out.

Wendall August Forge Co., Brockway, Pa., manufacturer of aluminum and other metal forgings, will erect one-story plant at Grove

METALS WRITE THEIR AUTOGRAPHS

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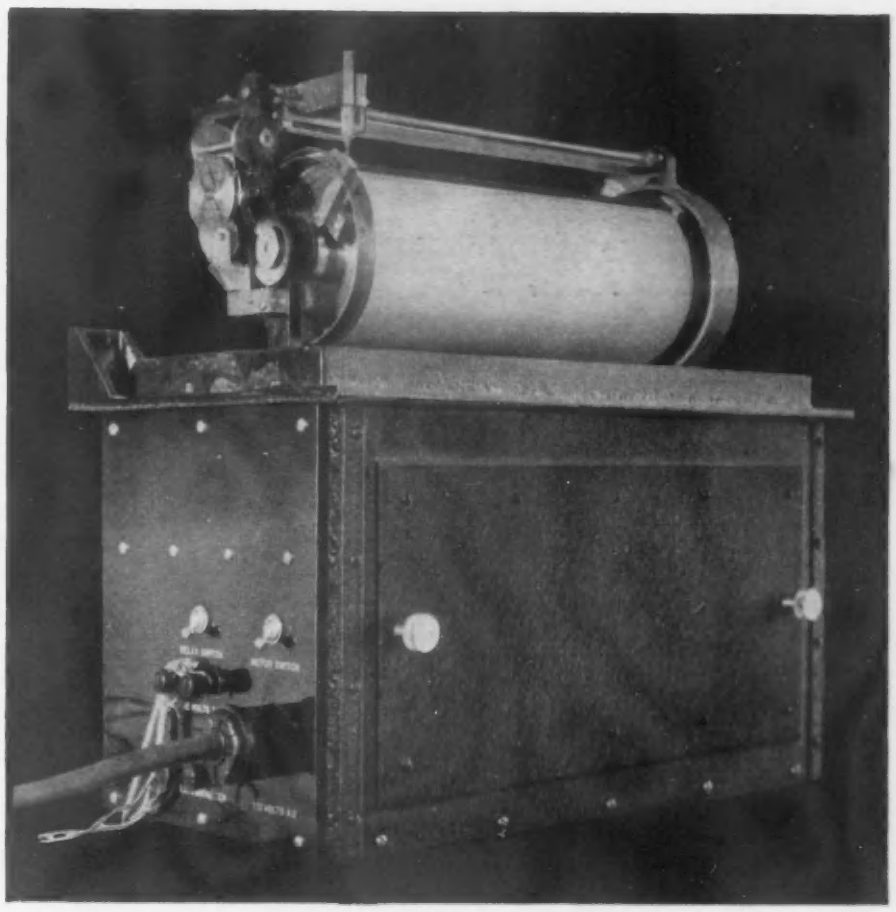

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BALDWIN-SOUTHWARK CORPORATION

SOUTHWARK

SOUTHWARK DIVISION
PHILADELPHIA, PA.

City, Pa., 60 x 160 ft. Cost over $35,000. Present works will be removed to new location.

Kohler Aviation Corpn., Connors and Gratiot Streets, Detroit, has awarded general contract to J. B. Rose, 3461 Haverhill Avenue, for new seaplane hangar with shop and reconditioning facilities at Cleveland. Cost over $25,000 with equipment.

Board of Trustees, Oberlin College, Oberlin, Ohio, is arranging call for bids for steam power plant for central steam heating service, 60 x 80 ft., with installation of three-400-hp. boilers and auxiliary equipment. Cost over $300,000 with equipment. John Paul Jones, Cary & Miller, Inc., Terminal Tower, Cleveland, are consulting engineers.

Macke Packing Co., Lima, Ohio, care of D. E. Simmons, 402 Elmwood Place, recently organized by Mr. Simmons and associates, has taken over Bruner Building, Wapakoneta, Ohio, and plans installation of canning machinery and other equipment. Wilburt Macke, St. Marys, Ohio, will be one of heads of company.

Stoops Packing Co., Van Wert, Ohio, plans early rebuilding of portion of packing and canning plant recently destroyed by fire. Cost close to $100,000 with machinery.

Huber Auto Body & Repair Co., Cleveland, care of J. Virgil Cory, Terminal Tower, has been organized by J. B. Johnson and D. E. Carlson, Cleveland, to manufacture automobile bodies and operate general body repair works.

Chevrolet Motor Ohio Co., 900 West Central Avenue, Toledo, Ohio, is increasing production at local assembling plant, and has adopted a two eight-hour shift basis on five-day week schedule, employing about 1600 men.

Contracting Officer, Material Division, Wright Field, Dayton, Ohio, asks bids until May 25 for four sand blast cabinets with ventilators (Circular 387), storage tanks. (Circular 402), 162 steel disks (Circular 393), 85 portable electric drills (Circular 394), 500 pairs non-shatterable grinding goggles; until May 31 for quantity of thread gages (Circular 399), two electric trucks (Circular 398), 300 tachometer assemblies (Circular 401), and one battery charging outfit (Circular 397).

Goodyear Tire & Rubber Co., Akron, Ohio, has leased property at Milwaukee Airport, Milwaukee, and plans erection of hangar with repair and reconditioning facilities for non-rigid airships of large type. Cost over $70,000 with equipment.

McQueen Sign & Advertising Co., Canton, Ohio, manufacturer of signs, displays, etc., plans one-story factory. Cost about $23,000 with equipment.

Village Council, Roseville, Ohio, plans installation of pumping machinery and auxiliary equipment in new municipal waterworks. Bond issue of $40,000 is being sold. W. R. Swingle is village clerk.

Board of Trustees, DePauw University, Newcastle, Ind., has revised plans for addition to central steam power plant, including improvements in present unit, with new steel stack 130 ft. high, coal and ash-handling equipment, boiler, pumps and auxiliary equipment

Ford Motor Co., Dearborn, Mich., has resumed operations at assembling plant at Indianapolis, and will concentrate on production of four and eight-cylinder cars and commercial automobiles. Employment is being given to about 700 men.

Essex Wire Corpn., 37 Manchester Street, Detroit, manufacturer of electric wires, cables, etc., is arranging for acquisition of plant and business of Jonesboro Insulated Wire & Rubber Co., Jonesboro, Ind., recently in financial difficulties, and will operate as a branch plant for production of commercial wire products. Improvements will be made.

Bright, Inc., Indianapolis, has been organized by Martin C. Bright and Frank S. Langsenkamp, Jr., 6443 Park Avenue, to manufacture machinery and parts.

Clouse Machine Products Co., Indianapolis, has leased space in Marmon Industrial Center, Kentucky Avenue and Morris Street, for production of machine and tool specialties.

Line-O-Scribe, Inc., Adrian, Mich., manufacturer of show-card writing machines, parts, etc., has leased local factory of Titan Electric Co. and will occupy early in June, when expansion will be carried out. Titan company will remove to another building.

General Motors Truck Co., Pontiac, Mich., is increasing operations and has begun production on large order for yellow parlor car buses of 33-passenger type, recently received from Greyhound Management Co., Chicago, totaling about $2,000,000. Plant has also started work on order for 1,500 mail truck bodies, to be delivered within next four months.

Handy Heater Co., Detroit, has been organized by Fred J. Lyon and William F. Klemm, 16233 Steel Avenue, to manufacture electric heaters, humidifiers and kindred equipment.

City Engineering Department, Waterworks Division, Grand Rapids, Mich., has plans for a steel standpipe, reservoir and other equipment for storage and distributing of 1,500,000 gal. water for municipal system.

Norge Corpn., 7601 Central Avenue, Detroit, manufacturer of electric refrigerators, is running on a full-time schedule at Detroit and Muskegon, Mich., plants. Company recently shipped five trainloads of refrigerator units at one time from last noted plant.

Pure Oil Co., 35 East Wacker Drive, Chicago, is considering erection of bulk oil storage and distributing plant on 40-acre tract at Midland, Mich. A refinery is planned at same location later.

Auto-Vac Mfg., Inc., Detroit, has been organized by Philip H. Bryan and Arthur J. Bonninghausen, 712 Griswold Building, to manufacture automobile equipment.

Woodward Engineering Co., bankrupt, Fort Wayne, Ind.; F. A. Schack, trustee-in-bankruptcy, Fort Wayne, offered plant and equipment, including machine tools, cranes, hoists, rolling mill machinery, etc., at public auction May 16.

◀ MIDDLE WEST ▶

United States Signal Corps, Procurement District, Chicago, asks bids until May 24 for 3724 binding posts (Circular 53).

Board of Education, Macomb, Ill., plans installation of manual training department in new junior high school unit. Cost about $90,000. General contract let to C. Van Etten, Macomb. Cervin & Stuhr, Safety Building, Rock Island, Ill., architects.

City Council, Whitehall, Ill., has plans for a municipal electric light and power plant. Cost about $70,000 with equipment. Russell & Axon, Roosevelt Building, St. Louis, are consulting engineers.

McIntyre & Brotman Mfg. Co., 2939 Clybourne Avenue, Chicago, has been organized by J. P. McIntyre and H. B. Brotman, to manufacture electrical appliances and equipment.

Emil F. Luetke, Hutchinson, Minn., heretofore in charge of sheet metal department of Zila Hardware Co., same place, has purchased sheet metal division of Hutchinson Hardware Co. and will operate a sheet metal works under own name.

City Council, Hutchinson, Minn., is considering erection of a municipal electric light and power plant. Cost over $125,000 with equipment. D. A. Adams is city clerk.

Iowa Electric Co., Dows Building, Cedar Rapids, Iowa, plans construction of transmission lines in Scott and Jackson counties.

Colorado Gold Refineries, Inc., Denver, care of Harry W. Robinson, president, 2203 South Guilpin Street, is considering erection of new ore-treating mill, including power house, machine shop and other units. Cost close to $200,000 with equipment.

Ornamental Furniture Hardware Co., 1330 Tenth Street, Rockford, Ill., has been organized by John T. Holmstrom and Paul W. Lundell, Rockford, capital $100,000, to manufacture hardware products.

City Council, North Mankato, Minn., is considering erection of a municipal electric light and power plant. Cost over $75,000 with machinery. E. M. Charles, Municipal Building, is city clerk.

Midwest Refining Co., 910 South Michigan Avenue, Chicago, subsidiary of Standard Oil Co. of Indiana, same address, has acquired Argo Oil Co., Casper, Wyo., operating in Salt Creek, Lance Creek and Mule Creek oilfields of Wyoming. Properties will be used for expansion in output in this district. Purchasing company has begun erection of a new gasoline refinery at Casper, to replace an obsolete plant, and will also electrify different departments. Cost over $250,000.

Conoco Oil Co., 310 South Michigan Avenue, Chicago, a subsidiary of Continental Oil Co., has purchased Cosden Oil Co. of Illinois, 2222-58 Herndon Street, with bulk oil storage and distributing plants in Illinois, Wisconsin and Michigan. Purchasing company will carry out expansion, and will maintain headquarters at main storage and distributing plant, last address noted.

Pollard Bros. Mfg. Co., manufacturer of steel factory equipment, 4034-36 N. Tripp Avenue, Chicago, will remove to larger quarters at 4444-4446 North Knox Avenue on June 1.

◀ PACIFIC COAST ▶

City Council, Vernon, Cal., asks bids until May 23 for one-story municipal power plant, 170 x 240 ft. City engineering department in charge.

United States Engineer Office, San Francisco, asks bids until May 31 for spare crankshaft for United States dredge.

Board of Education, San Gabriel, Cal., plans one-story vocational shop at new high school. Special election called to vote bonds from $246,500 to $345,000, according to character of buildings. Marsh, Smith & Powell, 816 West Fifth Street, Los Angeles, are architects.

Utah Gold Mining & Milling Co., Salt Lake City, Utah, care of F. W. McEntire, 155 Second Avenue, engineer, plans erection of new ore-treatment mill in Park Valley district. Cost over $80,000 with equipment.

American Type-O-Writer Co., Fullerton, Cal., care of William E. Baff, 205 South Broadway, Los Angeles, has been organized by Andrew Good, Fullerton, and Howard N. Farmer, Alhambra, Cal., capital $50,000, to manufacture typewriters and parts.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until May 24 for one centrifugal horizontal pump (Schedule 8055) for San Diego Navy Yard; until May 31 for two steel mooring buoys (Schedule 8000) for Mare Island Navy Yard.

Springville Commercial Alcohol Co., Salt Lake City, Utah, recently organized with capital of $150,000 by interests connected with Utah-Idaho Sugar Co., same place, will take over plant and business of Utah Industrial Alcohol Co., in Springville district, near Salt Lake City, recently defunct. New company will make extensions and improvements and place plant in service soon.

Scenic Airways Corpn., Pocatello, Idaho, is arranging for lease of land at municipal airport, and plans erection of hangar with repair and reconditioning shop.

United States Engineer Office, Portland, asks bids until June 2 for two boilers with generating capacity of 45,000 lb. steam an hour for United States dredge (Circular 393).

City Light Department, Pasadena, Cal., has plans for three industrial buildings, each one-story, 63 x 221 ft., for equipment storage and distributing service; 33 x 87 ft., for general mechanical and wood-working shop; and 33 x 89 ft., for transformer and equipment repair shop. Marston & Maybury, 25 South Euclid Avenue, are architects.

◀ FOREIGN ▶

Kodak Aktiengesellschaft, Berlin, manufacturer of cameras, parts, etc., subsidiary of Eastman Kodak Co., Rochester, N. Y., has acquired Nagel Camera Works, Stuttgart, Germany, operated by Dr. August Nagel, and will develop as new plant unit, making third factor of Eastman company in Germany. Dr. Nagel will continue in charge.

Soviet Russian Government, Moscow, has authorized erection of new motor truck plant at Yaroslavl, work to begin this year, with rated annual capacity of 27,000 heavy type motor trucks. Cost 150,000,000 rubles (about $75,000,000) with equipment. Government has approved appropriation of 2,500,000,000 rubles (about $1,250,000,000) for Soviet railroads during 1932, of which about 200,000,000 rubles ($100,000,000) will be used for construction of locomotive and car repair shops, including extensions and improvements in present shops, plants for production of spare parts, and auxiliary shops; 95,000,000 rubles ($47,500,000) for housing developments for railroad workers; 430,000,000 rubles ($215,000,000) for purchase of new rolling stock; 380,000,000 rubles ($190,000,000) for new line construction; 830,000,000 rubles ($415,000,000) for reconstruction and extensions in present lines; remainder for capital repairs and improvement in equipment, track and rolling stock. Amtorg Trading Corpn., 261 Fifth Avenue, New York, is official buying agency.

Sydsvenska Kraftaktiebolaget, Stockholm, Sweden, operating electric power plants and systems, has applied for permission to furnish power for new electric railway line now being built from Stockholm to Malmo. Company proposes to build high-tension transmission system, 102 miles long, with power substations and auxiliary structures. Cost 5,550,000 kroner (about $1,430,000).

PILGRIMS MADE PIG IRON

IN THE VIRGINIA COLONIES, as in the mother country, the iron industry for a time knew only wrought iron, forge produced. The Pilgrims, in Massachusetts, fresh from British soil, had more advanced ideas. ››› In 1643 John Winthrop, Jr., son of the governor of the Massachusetts colony, went to England and raised capital of one thousand pounds sterling to build the first blast furnace in America at Lynn, making iron the next year. ››› Three years later it had reached the then impressive total of seven tons of pig iron a week. For 100 years Massachusetts was the chief seat of iron manufacture in the colonies. ››› When Connecticut men purchased the Western Reserve on the shores of Lake Erie the first settlers had an interest in iron and a respect for its importance in the development of a new nation. ››› This grew with the years and lives today in interest of so many industrial leaders of the Great Lakes region in producing and shipping ore and coal and making iron and steel.

As the requirements of industry have increased, the business of producing iron has become more complex, until only a strong organization with modern plants and ample ore and coal reserves can be relied upon to meet all demands. Interlake Iron Corporation, with plants at four strategic points, is well equipped to meet these industrial requirements promptly.

INTERLAKE IRON CORPORATION

PIG IRON ✓ COKE

PICKANDS, MATHER & COMPANY, Sales Agents

CLEVELAND ✓ CHICAGO ✓ DETROIT ✓ ERIE

Notable Advance Made in Foundry Practice

(*Concluded from page* 1099)

of dross was considered one of the unavoidable evils. The electric furnace is being used in brass melting to produce closer grained castings.

In contrast is the interesting experience of several foundries in returning to a former type of melting furnace. A development several years ago brought into vogue the tilting crucible furnace, but, as requirements of quality tightened, these furnaces were discarded and the foundries in question returned to the previous form of coke-fired pit crucible furnaces because it was found that these furnaces, being more confined, were less apt to oxidize and the resultant better quality offset the higher cost of operation.

Nearly all of the brass types of alloy castings have shown quality increases commensurate with those in the ferrous field. A. W. Cadman Mfg. Co., Pittsburgh, has been making a typical gear bronze for several years and the specifications on this particular material in 1922 called for a yield point of 26,000 lb. per sq. in. and a tensile strength of 42,000 lb. Specifications covering the same alloy at present call for a yield point of 38,000 lb. per sq. in. and a tensile strength of 55,000 lb. Other properties are shown in Table IV.

Gray Iron Is More Sound

THE mass production methods introduced about 10 years ago carried with them some sacrifices in quality, and one of the most notable achievements in the gray iron industry since that time has been the regaining of high quality without loss of production method costs. The demands for exceptionally high-grade gray iron castings have increased, and assurance of freedom from defects has been secured which would have been impossible to give even five years ago. An example of this is the case of certain telephone work where even the slightest speck or flaw in the grain structure produces an objectionable click in the instrument. For this type of work a new method of testing, combining the magnetic principle with sound waves, was developed.

As in the case with steel castings, gray iron foundrymen are demanding and securing better raw materials than ever before. It is not enough to supply pig iron to meet chemical specifications. The discriminating foundryman wants the pig iron to have a good appearance and to produce definite results in his foundry practice. Some foundrymen are even going so far as to ignore the chemical composition and to purchase on a performance basis, leaving the responsibility of selection up to the pig iron producer. This means that the furnace representative must be an engineer and metallurgist, and must study his customers' methods and then be able to furnish a pig iron which will give specified properties in the casting.

In an attempt to get greater and greater tensile strength into gray iron castings, foundrymen have turned to alloys, usually of the so-called semi-steel variety. Others have used nickel and chromium, and special brands of pig iron also have come in for their share in this development. One important gray iron foundry reports that the use of special brands of pig iron and better all around foundry practice has enabled it to secure castings that are tougher and more dense, more uniform and that have greater machineability and greater tensile strength than the castings produced ten years ago.

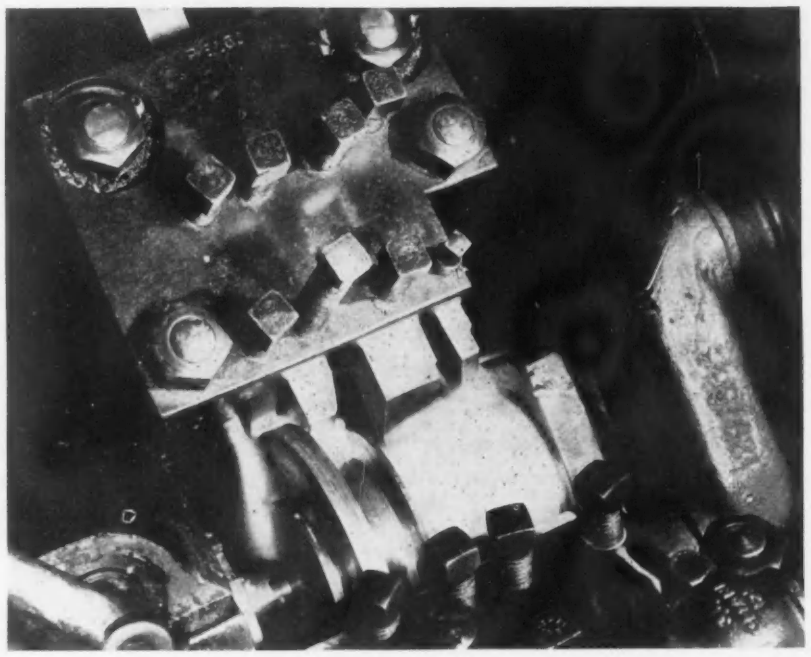
The Future Foundryman

ONE of the results of recent progress in the foundry industry is a better picture of the foundryman of the future. Unquestionably the progressive foundryman can no longer be dogmatic about the method of fabricating a specified part. He must be honest with himself, as well as with his customer, and supply a casting when a casting is indicated, but he must be ready to furnish a welded steel part or a combination of rolled steel and casting if such welded part or combination produces the best result for the customer. The future foundryman must be an engineer. He must be able to take the drawings of his customer's product and give an intelligent, sound, authoritative opinion on the best production method.

It seems evident at present that an increasing premium will accrue to the foundry which develops a more complete service to the customer. This is already the case in other lines. The future foundryman who will study his customer's problems and then give him products best suited to solve these problems certainly will have a strong advantage.

How Buick Machines Its Crankshaft

(*Concluded from page* 1115)



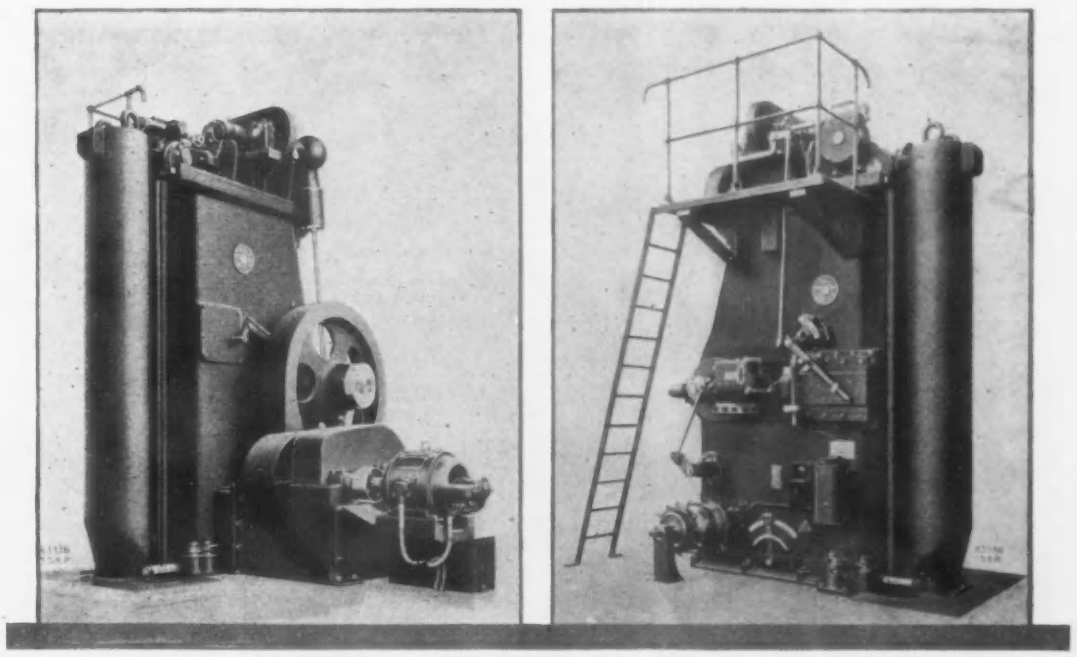
Rough turning the flange oil deflector on a center-drive lathe.

weight to the crankshaft follows, the studs being welded to the counterweight by a dual arc welder. During the welding operation the crankshaft bearings are protected from the heat of the welder by steel boards.

Crankshafts go through a straightening machine again for checking purposes and are tested for balance and marked for drilling and grinding to correct balance. Shafts then are drilled to balance on a 21-in. drill, after which they are rechecked on a special balancing machine.

NEW
PLATE BENDING PRESS

for Plates up to 20′ x 2″



Correct and Even Bending from Edge to Edge • No previous bending operations necessary as is the case on other types of machines

SPECIAL FEATURES OF OUR VERTICAL PLATE BENDING PRESS—

1. *Considerably higher outputs as compared with bending rolls.*
2. *Safer and easier control of work, plates cannot bend back under their own weight.*
3. *Uniform bending on account of perfectly uniform strokes.*
4. *Security against breakages through overloading by means of hydraulic cushion and relief valve.*
5. *Small power consumption on account of direct motor drive and heavy flywheel.*

Schiess-Defries A.-G. Düsseldorf

REPRESENTATIVE FOR U.S.A.: U. KAUERMANN, FOUNTAIN SQUARE BLDG., CINCINNATI, OHIO

Machinery Exports Declined in March While Imports Gained

WASHINGTON, May 10.—Exports of machinery showed a slight decline to a value of $13,465,000 in March, against $13,753,000 in February. Outgoing shipments of industrial machinery, as classified by the Division of Statistics, Department of Commerce, dropped to $5,505,000 from $6,325,000.

Imports of machinery in March increased to a value of $691,313 from $575,767.

Imports of Machinery into the United States

(By Value)

	March		Three Months Ended March	
	1932	1931	1932	1931
Metal-working machine tools	$29,316	$37,099	$63,226	$72,326
Agricultural machinery and implements	126,272	699,147	285,759	1,771,488
Electrical machinery and apparatus	160,463	293,875	423,790	570,185
Other power generating machinery	32,449	44,611	87,131	77,112
Other machinery	274,899	314,894	837,923	1,119,029
Automobiles and other vehicles, except agricultural	67,914	118,527	185,382	299,747
Total	$691,313	$1,508,153	$1,883,211	$3,909,887

Machinery Exports

(By Value, in Thousands of Dollars)

	March		Three Months Ended March	
	1932	1931	1932	1931
Locomotives	$29	...	$107	$24
Other steam engines	8	$13	260	84
Boilers	14	73	27	101
Accessories and parts	26	86	80	166
Automobile engines	283	407	638	781
Other internal combustion engines	59	555	253	1,234
Accessories and parts for	126	208	358	592
Electric locomotives	17	...	33	59
Other electric machinery and apparatus	226	442	681	1,315
Excavating machinery	125	296	412	1,068
Concrete mixers	55	55	92	92
Road making machinery	25	162	72	340
Elevators and elevator machinery	174	470	270	857
Mining and quarrying machinery	437	988	1,165	3,308
Oil well machinery	152	472	2,876	857
Pumps	108	408	303	1,353
Bending and power presses	46	422	153	1,177
Forging machinery	110	293	361	972
Machine tools	468	2,444	1,812	7,456
Other metal working machinery and parts of	215	435	622	997
Textile machinery	484	656	1,456	1,730
Sewing machines	382	436	1,133	1,179
Shoe machinery	47	92	180	275
Flour-mill and gristmill machinery	11	51	29	80
Sugar-mill machinery	43	107	129	267
Paper and pulp mill machinery	44	112	150	368
Sawmill machinery	35	42	89	137
Other woodworking machinery	25	91	63	283
Refrigerating and ice making machinery	77	127	111	483
Air compressors	132	171	359	546
Typewriters	707	1,097	1,801	2,951
Power laundry machinery	2	86	87	258
Typesetting machines	78	174	249	625
Printing presses	220	240	370	520
Agricultural machinery and implements	1,253	5,176	3,135	39.144
All other machinery and parts	7,222	12,428	18,701	40,019
Total	$13,465	$29,315	$38,617	$111,698

Corrosive Gases Outwitted by Rustless Steel Door

THIS fire door, 10 x 12 ft., of interlocking slats was fabricated of high chrome nickel alloy steel for the ash removal department of the Abraham & Straus department store warehouse in Brooklyn. Allegheny metal was used by the Cornell Iron Works, Inc., Long Island City, New York, to replace ordinary sheet steel doors, which were damaged by corrosion from the gases of hot ashes in about one year. The interlocking slats are of No. 22 gage rustless steel, ⅞ in. deep in the crown, and sturdily built to withstand heavy wind pressure or forced entry. The door rolls overhead into a coil requiring about 16 in. head room above the lintel. It is raised or lowered in about 10 sec. by continuous, hand-operated chain.

ned

nths
arch

1931
$24
84
101
166
781
1,234
592
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1,068
92
340
857
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857
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1,177
972
7,456
997
1,730
1,179
275
80
267
368
137
283
483
546
2,951
258
625
520
39,144
40,019
41,698